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A NEW DEAL IN CONTRACTS

K. H. CONDIT
Editor

What it will be is still uncertain, but some of the fog is clearing up as Secretary Perkins starts forming an organization to administer the Walsh-Healey Act

A TEMPORARILY QUIET New Deal infant is resting in the lap of Secretary of Labor Perkins. Congress so framed the Walsh-Healey Government Contracts Act, which threatens to be as obstreperous if not as noisy as its late cousin, the National Industrial Recovery Act, that the Secretary of Labor has the task of nursing it through its teething period.

Most of us are so familiar with the legislative history of this offspring of labor politics and congressional carelessness that it will not be repeated here. High spots of the Act are given on the third page.

Secretary Perkins has begun the job of building an administrative organization by holding separate conferences with groups of industrial leaders, labor chiefs, government procurement officers, and legal experts from the office of the Attorney General. She is apparently well aware of the mistakes that made the NRA ineffective months before the Supreme Court gave it the coup de grace. Participants in these

Secretary Perkins sees some machined parts at the Naval Gun Factory

conferences report that the Secretary is displaying the impartial attitude which so difficult an administrative problem demands.

After the conferences an announcement came from the Secretary's office to the effect that there will be a board of three to handle the quasi-judicial functions under the Act, such as the promulgation of rules and regulations, and the making of exemptions in special cases. Obviously, this board will have to have a comprehensive staff of clerical and expert assistants. There will also be an advisory board of industrialists and labor representatives to be called upon when needed.

Date is September 28

The law takes effect September 28. After that date, says the Secretary, "Contracts awarded will include a representation by the contractor that he is a manufacturer or regular dealer . . . . , that employees engaged in work under the contract will not be employed longer than eight hours a day, nor more than 40 hours a week, that convict labor and child labor will not be used, and that no part of the contract will be performed, nor the material furnished or manufactured under working conditions which are insanitary or hazardous. The law fundamentally is designed to prevent the purchase of sweatshop goods by the government."

Eventually the Secretary will have to "ascertain minimum wages in the locality in industries or groups of industries performing government work." Since this will be a stupendous task other parts of the whole job are being tackled first. The statement goes on to say that the "sweatshop" industries will come first in any such ascertainment of wages. It is possible that industries where labor conditions are good may never be bothered. Before any wage minima are set there will be open hearings.

To eliminate the "bid-peddlers," contracts may only be awarded to regular dealers and manufacturers. This does not mean that bidders may not deal with legitimate sub-contractors. They are expected to have reliable sources of supply. The Act is aimed at the sweatshop sub-contractor.

As to overtime rates the statement says: "It is not expected that the 8-hour day and 40-hour week provisions will create any undue burden. There are very few industries today which generally exceed these limits. Under the authority of the Secretary of Labor to allow reasonable limitations, variations, tolerances and exemptions, the regulations may provide for overtime subject to the payment of the overtime rates prescribed by the act. As these will be the same for every employer bidding on a specific contract or class of contracts, all bidders will be put on equal footing in this respect. In fixing the amount of the overtime rate the Department will give consideration to conditions in continuous process industries or industries of an extra hazardous nature, seasonal peak production periods, flat weekly or monthly wage scales. The same consideration will be given to emergency conditions."

On the question of existing stocks, the interpretation is: "The regulations will probably provide for the purchase of floor stocks without going behind the actual and bona fide seller, when such stocks are in the dealer's possession when he submits his bid." The government will not permit goods manufactured specifically for a government contract, however, to become warehouse or floor stocks in order to evade the purposes of this act. The clause relating to goods purchasable in open market indicates that Congress intended to keep in effect present statutes permitting contracting officers to make purchases in the open market without advertising under certain conditions, and also intended that the existing limitations upon such purchases should not be affected by this act."

Open Market Issue

On this point there is wide difference of opinion. The Labor Department apparently intends to limit "open market" purchases to minor items, often emergency transactions done without advertising for bids. Legal advisers of the National Association of Manufacturers read the law quite differently. They cite the 8-hour law of 1912 which parallels closely, but not exactly, the phraseology of the Walsh-Healey Act. Several legal opinions on this law confirm their position that not very many items would come under the terms of the Walsh-Healey Act.

Among these opinions is one by Felix Frankfurter, New Deal legal mentor, in which he points out that exemptions could apply whether the articles were already manufactured, were to be manufactured after signing of the contract, or were made to specification. The Attorney General has ruled that exceptions under the 8-hour law include airplanes, engines, machinery, tools and wagons—some 65 in all.

On one point there does not seem to be much difference of opinion. The $10,000 limit specified in the first paragraph of the Act applies to one transaction or bid, and not to pooled orders or bids. In other words, a firm might take an order for $9,000 worth of material every day in the week, and still be exempt from the provisions of the Act. A firm securing only one $11,000 order during the whole year might be held to the letter of the law.

When it comes to sub-contracts there is another argument. One group holds that compliance certificates will be necessary, others do not believe they will be, and are prepared to fight hard to avoid such red tape.

Another point on which there is no information as yet is the application of the wage limits to supervisory forces. Possibly working foremen will be included. Probably supervising foremen will not.

Secretary Perkins promises to issue regulations governing bids covered by the Walsh-Healey Act shortly before September 28. It will be many months before the machinery of administration functions smoothly, and the many legal difficulties are ironed out.

A canvass of sentiment among machine tool builders indicates that some of them are going to decline to bid under the terms of the new law. Others have the idea that it applies more particularly to construction work and equipment supplied on contract, that machine tools fall under the open-market clause.

The suggestion has been made that bids for equipment can be so manipulated that no single piece of a bid exceeds the $10,000 limit, thereby avoiding the provisions of the law. Some of the procurement officers foresee this possibility, too. Army and Navy buyers are likely to look favorably on such a procedure, Secretary Ickes and his subordinates will probably do just the opposite.

Cites Industry's Objections

Herman H. Lind, general manager of the National Machine Tool Builders' Association, has given me the following statement which expresses industry's major objections to the Act:

"There are many angles and implications of the Walsh-Healey Government Contracts Bill that will cause industry to stop, look and listen. The intent of the Bill supposedly is to bear down on sweatshop operations through the force of the contractual power of the government. In a distinctly low percentage of industry, however, do sweatshop conditions prevail. "Business comes to few plants in an even flow that will permit approximately the same number of men to work the same number of hours at the same task day after day and week after week.

Goods must be made in response to orders and this necessitates flexibility in plant operations. At the same time industry is interested in keeping its regular employees at work and wishes to avoid having to call in extra workers for short periods only to lay them off again when the rush work is over.

"While the Bill provides that exceptions and exemptions may be granted by the Secretary of Labor, the experience of working with exceptions and exemptions under NRA makes this method appear entirely impracticable. In the tendency indicated by this Bill for the government to control plant operations lies the greatest danger to the continued upbuilding of American industry and the higher standard of living."

It is my understanding that Secretary Perkins did her best to get from Congress a bill that would be clearly stated, and therefore easily administered. I leave it to any reader to say whether that's what she got from the House Judiciary Committee. As passed, the Walsh-Healey Act with its vague limits, ambiguous definitions, and numerous exceptions and exemptions opens the gate wide to another flood of executive orders and departmental decisions that will be annoying to industry and expensive to the taxpayer. Perhaps that is what was intended.

ABSTRACT OF WALSH-HEALEY ACT

BE IT ENACTED *by the Senate and House of Representatives of the United States of America in Congress assembled*, That in any contract made and entered into by any executive department, independent establishment, or other agency or instrumentality of the United States, . . . for the manufacture or furnishing of materials, supplies, articles, and equipment in any amount exceeding $10,000, there shall be included the following representations and stipulations:

(a) That the contractor is the manufacturer of or a regular dealer in the materials, supplies, articles, or equipment to be manufactured or used in the performance of the contract;

(b) That all persons employed by the contractor in the manufacture or furnishing of the materials, supplies, articles, or equipment used in the performance of the contract will be paid, without subsequent deduction or rebate on any account, not less than the minimum wages as determined by the Secretary of Labor to be the prevailing minimum wages for persons employed on similar work or in the particular or similar industries or groups of industries currently operating in the locality in which the materials, supplies, articles, or equipment are to be manufactured or furnished under said contract;

(c) That no person employed by the contractor in the manufacture or furnishing of the materials, supplies, articles, or equipment used in the performance of the contract shall be permitted to work in excess of eight hours in any one day or in excess of forty hours in any one week;

(d) That no male person under sixteen years of age and no female person under eighteen years of age and no convict labor will be employed by the contractor in the manufacture or production or furnishing of any of the materials, supplies, articles, or equipment included in such contract; and

(e) That no part of such contract will be performed nor will any of the materials, supplies, articles, or equipment to be manufactured or furnished under said contract be manufactured or fabricated in any plants, factories, buildings, or surroundings or under working conditions which are unsanitary or hazardous or dangerous to the health and safety of employees engaged in the performance of said contract. Compliance with the safety, sanitary, and factory inspection laws of the State in which the work or part thereof is to be performed shall be prima facie evidence of compliance with this sub-section.

THAT any breach or violation of any of the representations and stipulations in any contract for the purposes set forth in section 1 hereof shall render the party responsible therefor liable to the United States of America for liquidated damages, in addition to damages for any other breach of such contract, the sum of $10 per day for each male person under sixteen years of age or each female person under eighteen years of age, or each convict laborer knowingly employed in the performance of such contract, and a sum equal to the amount of any deductions, rebates, refunds, or underpayment of wages due to any employee engaged in the performance of such contract; and, in addition, the agency of the United States entering into such contract shall have the right to cancel same and to make open-market purchases or enter into other contracts for the completion of the original contract, charging any additional cost to the original contractor.

THE Comptroller General is authorized and directed to distribute a list to all agencies of the United States containing the names of persons or firms found by the Secretary of Labor to have breached any of the agreements or representations required by this Act. Unless the Secretary of Labor otherwise recommends no contracts shall be awarded to such persons or firms or to any firm, corporation, partnership, or association in which such persons or firms have a controlling interest until three years have elapsed from the date the Secretary of Labor determines such breach to have occurred.

THE Secretary of Labor is hereby authorized and directed to administer the provisions of this Act and to utilize such Federal officers and employees and, with the consent of the State, such State and local officers and employees as he may find necessary to assist in the administration of this Act and to prescribe rules and regulations with respect thereto. The Secretary shall appoint, without regard to the provisions of the civil-service laws but subject to the Classification Act of 1923, an administrative officer, and such attorneys and experts, and shall appoint such other employees with regard to existing laws applicable to the employment and compensation of officers and employees of the United States, as he may from time to time find necessary for the administration of this Act. The Secretary of Labor or his authorized representatives shall have power to make investigations and findings as herein provided, and prosecute any inquiry necessary to his functions in any part of the United States. The Secretary of Labor shall have authority from time to time to make, amend, and rescind such rules and regulations as may be necessary to carry out the provisions of this Act.

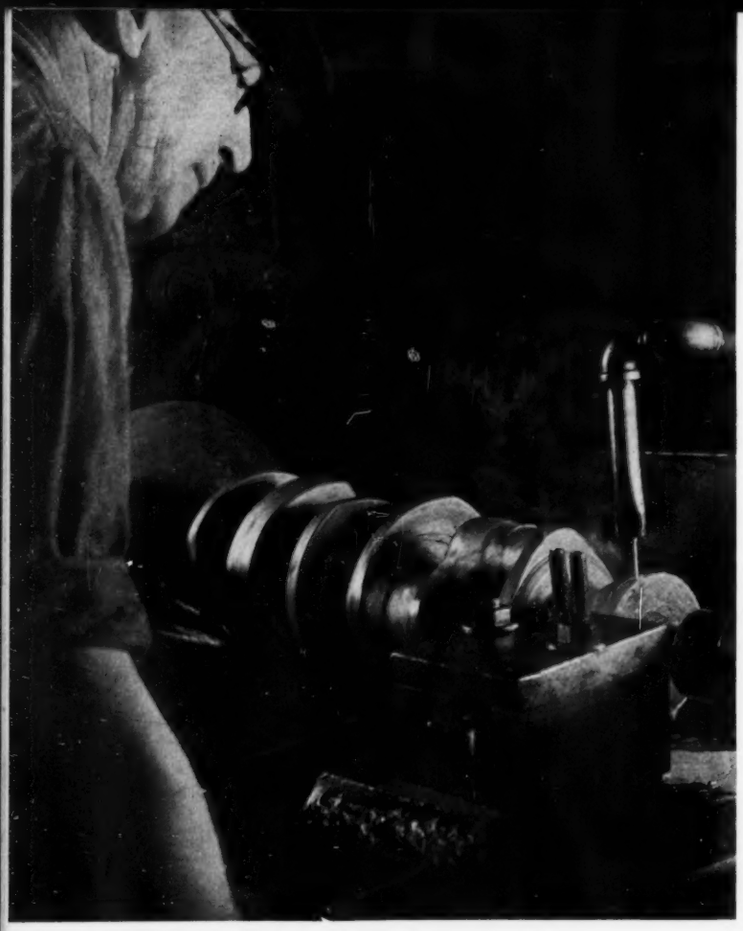
UPON his own motion or an application of any person affected by any ruling of any agency of the United States in relation to any proposal or contract involving any of the provisions of this Act, and on complaint of a breach or violation of any representation or stipulation as herein provided, the Secretary of Labor, or an impartial representative designated by him, shall have the power to hold hearings and to issue orders requiring the attendance and testimony of witnesses and the production of evidence under oath. Witnesses shall be paid the same fees and mileage that are paid witnesses in the courts of the United States. In case of contumacy, failure, or refusal of any person to obey such an order, any District Court of the United States or of any Territory or possession, or the Supreme Court of the Distict of Columbia, within the jurisdiction of which the inquiry is carried on, or within the jurisdicton of which said person who is guilty of contumacy, failure, or refusal is found, or resides or tranacts business, upon the application by the Secretary of Labor or representative designated by him, shall have jurisdiction to issue to such person an order requiring such person to appear before him or representative designated by him, to produce evidence if, as, and when so ordered, and to give testimony relating to the matter under investigation or in question; and any failure to obey such order of the court may be punished by said court as a contempt thereof; and shall make findings of fact after notice and hearing, which findings shall be conclusive upon all agencies of the United States, and if supported by the preponderance of the evidence, shall be conclusive in any court of the United States; and the Secretary of Labor or authorized representative shall have the power, and is hereby authorized, to make such decisions, based upon findings of fact, as are deemed to be necessary to enforce the provisions of this Act.

UPON a written finding by the head of the contracting agency or department that the inclusion in the proposal or contract of the representations or stipulations set forth in section 1 will seriously impair the conduct of Government business, the Secretary of Labor shall make exceptions in specific cases or otherwise when justice or public interest will be served thereby. Upon the joint recommendation of the contracting agency and the contractor, the Secretary of Labor may modify the terms of an existing contract respecting minimum rates of pay and maximum hours of labor as he may find necessary and proper in the public interest or to prevent injustice and undue hardship. The Secretary of Labor may provide reasonable limitations and may make rules and regulations allowing reasonable variations, tolerances, and exemptions to and from any or all provisions of this Act respecting minimum rates of pay and maximum hours of labor or the extent of the application of this Act to contractors, as hereinbefore described. Whenever the Secretary of Labor shall permit an increase in the maximum hours of labor stipulated in the contract, he shall set a rate of pay for any overtime, which rate shall be not less than one and one-half times the basic hourly rate received by any employee affected.

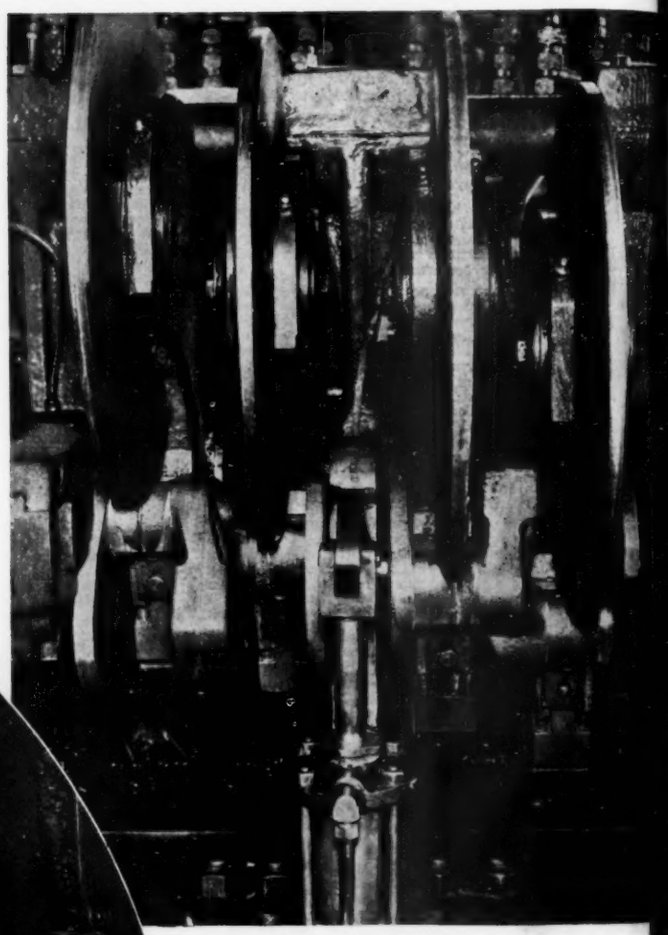
THIS Act shall not apply to purchases of such materials, supplies, articles, or equipment as may usually be bought in the open market; nor shall this Act apply to perishables, including dairy, livestock and nursery products, or to agricultural or farm products processed for first sale by the original producers; nor to any contracts made by the Secretary of Agriculture for the purchase of agricultural commodities or the products thereof. Nothing in this Act shall be construed to apply to carriage of freight or personnel by vessel, airplane, bus, truck, express, or railway line where published tariff rates are in effect or to common carriers subject to the Communications Act of 1934.

THIS Act shall apply to all contracts entered into pursuant to invitations for bids issued on or after ninety days from the effective date of this Act: *Provided, however*, That the provisions requiring the inclusion of representations with respect to minimum wages shall apply only to purchases or contracts relating to such industries as have been the subject matter of a determination by the Secretary of Labor.

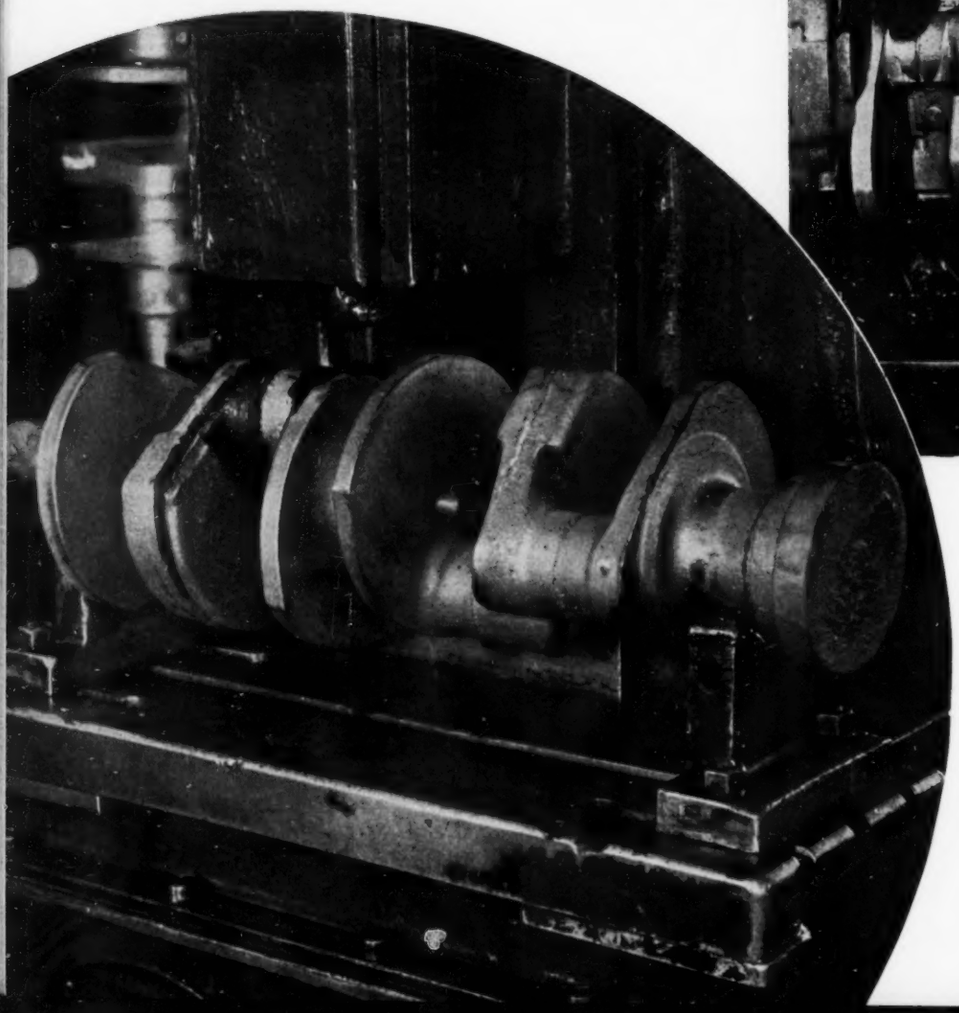
FORD'S CAST CRANKSHAFTS UNDER CUT



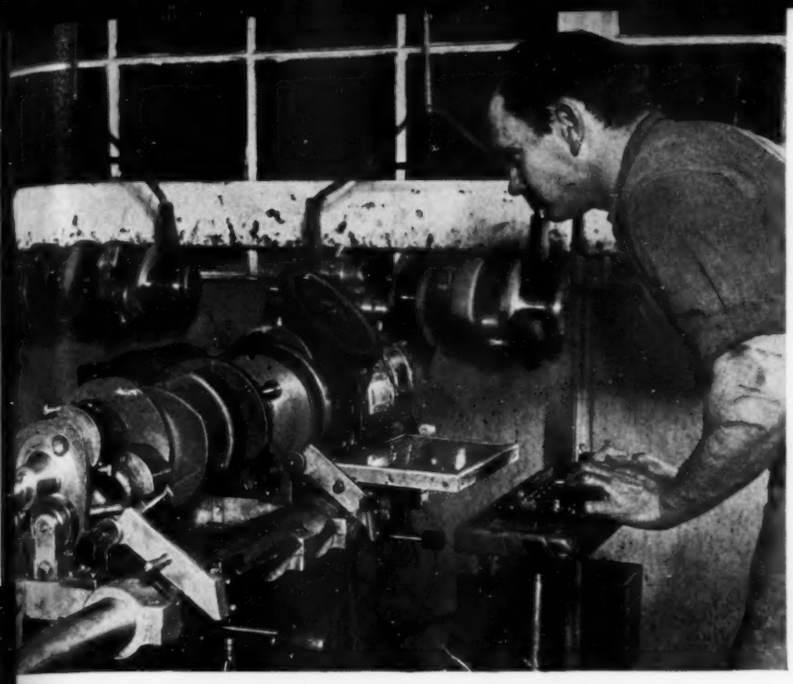
Hydraulic clamping and feed are used in rough turning the flange O.D. and fan pulley diameter at Ford Motor Company



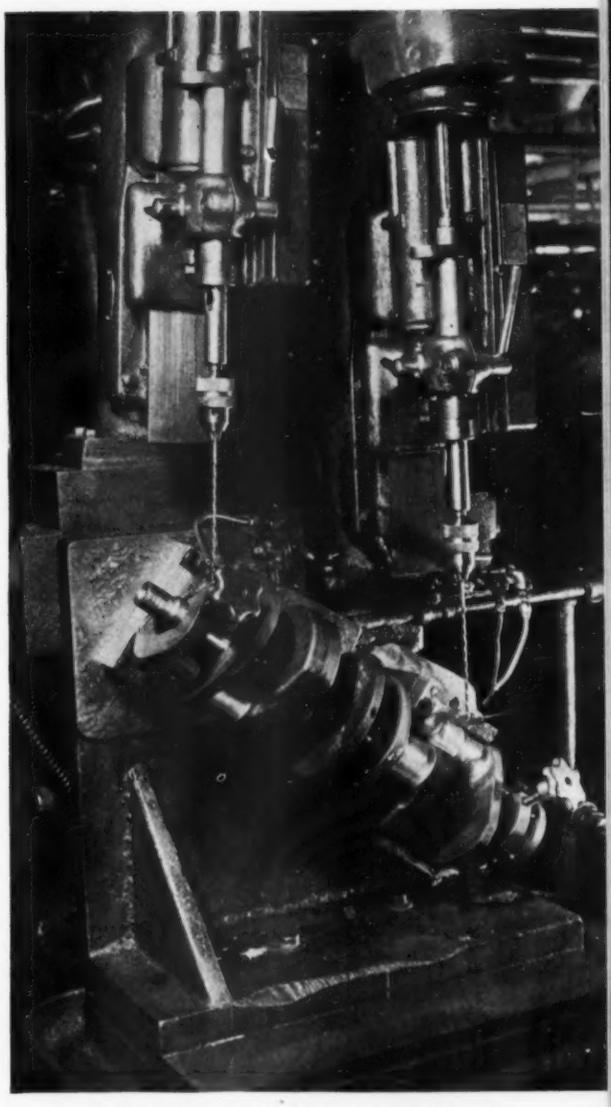
An automatic crankshaft lathe turns the four pin bearings simultaneously at 40 ft. per min.



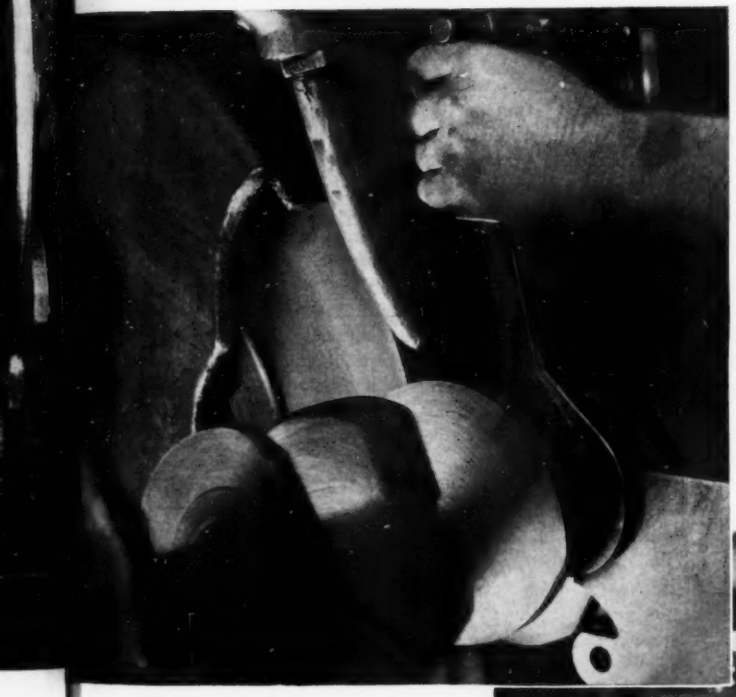
A 30-lb. hammer is lifted 30 in., dropped freely on a suspended crank throw for an impact test



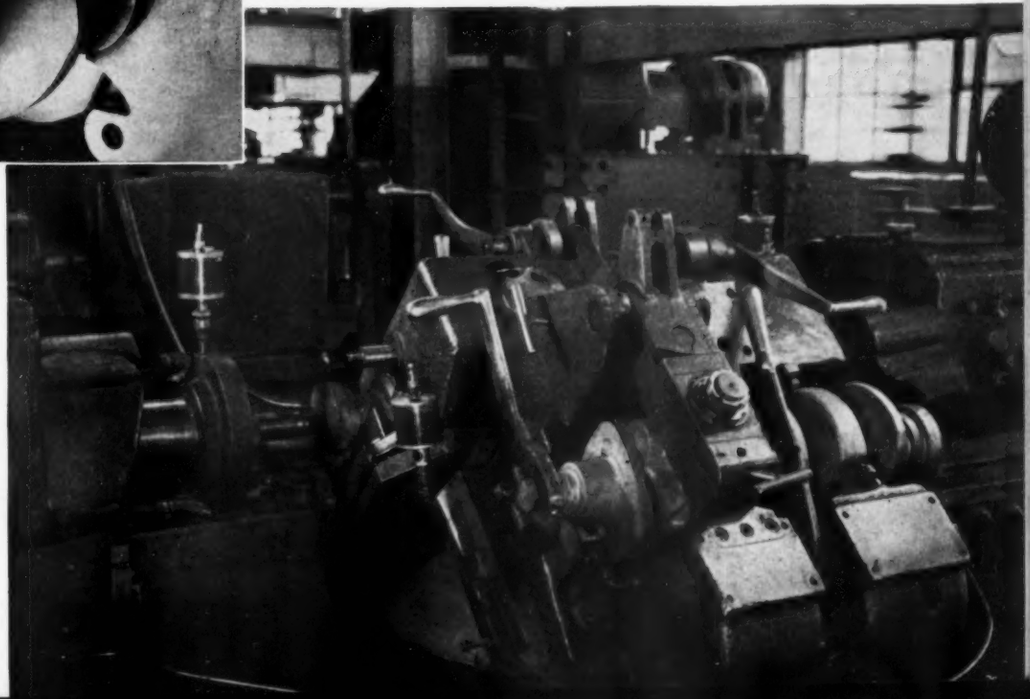
"Bob" weights clamped around the throws represent pistons and rods in dynamically balancing the crankshafts to within 0.2 in.-ounces.



With the work held at an angle, oil holes 4½ to 5 in. long and 3/16 in. in diameter are drilled in Ford crankshafts



Located on centers, the main bearing is rough ground to establish a steady rest surface for succeeding operations



Centering is done in a double-headed machine with a duplex fixture; shafts are located from the large counterweights

THREE DIMENSIONAL STORAGE

CUTS SPACE

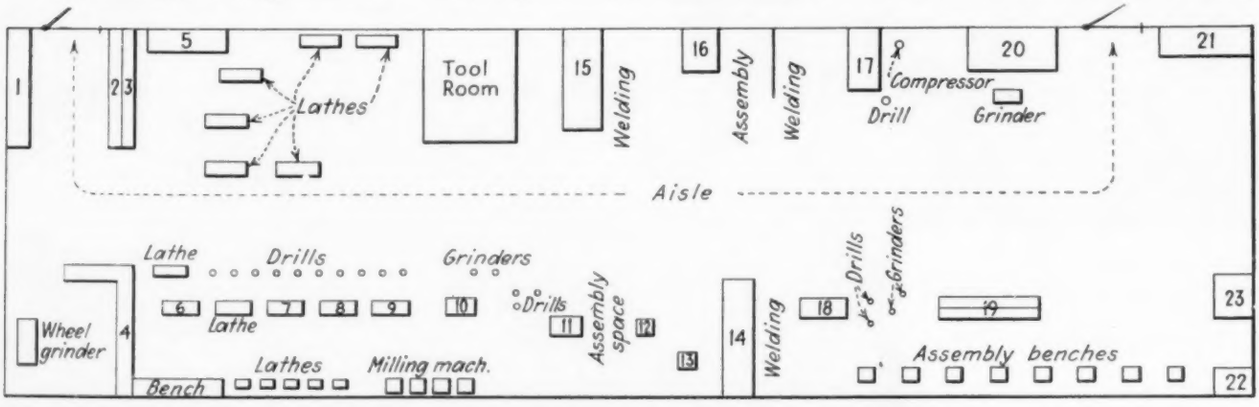
Efficient use of existing facilities gives maximum capacity from limited storage space

FRANCIS WESTBROOK

IT WOULD be odd indeed if a manufacturer of materials - handling equipment did not take his own medicine. Economical use of floor space and efficient handling apply with just as much force in his shop as anywhere else. Nathaniel Warshaw, chief engineer of the Lewis-Shepard Company, says that if it were not for the "three-dimensional storage system" the area of the machine shop would have to be increased 25 per cent for the same volume of production.

Three-dimensional storage means using racks and boxes with skid bases which may be set on top of each other instead of spreading the materials over the floor or benches and using up valuable space. The system is used for process parts, tools and fixtures in more or less constant use. Its economy can only be realized when the unit loads can be handled quickly and easily with stackers and lift trucks.

Twenty-three racks with shelves and boxes are distributed around the main machine shop as shown in the floor layout, Fig. 1. The room measures 200x50 ft. In addition to the machine tools, considerable space is utilized for arc welding and assembly. The relation of these racks to the various machines is shown as well as the purposes for which they are used. Rack No. 14 is illustrated in Fig. 2. Each vertical section contains all the unit parts and the hoisting mechanism needed for the assembly of one stacker. The hoisting mechanism is visible in the top compartment and is lifted in and out by the stacker at the right. In the lower portion of each section is a portable rack with skid base. The various small parts required are placed in the several shelves. All these items



1, 2, 3—Racks for boxes with skid bases
4—Small bins
5—Rack for bar stock
6—Stacked boxes with skid bases
7, 8—Shelves with skid bases for drill jigs
9, 10—Stacked boxes with skid bases, 2 and 3 tiers high
11, 12, 13—Shelves for parts and tools
14—Rack for unit assemblies of stackers,
15—Shelves and racks for welding jigs
16—Racks for parts
17—Racks for stock used in welding
18—Stacked skid boxes
19, 20—Shelves and compartments for stock and parts
21—Racks for angle steel
22—Shelves for tools
23—Shelves for stock and jigs

Fig. 1—As the layout shows, the machine shop of the Lewis-Shepard Company has 23 racks placed convenient to the various operations in order to supply process parts, tools, dies and fixtures without waste of time or effort

Fig. 2—Each of the vertical sections contains all components for assembly of one of the stackers shown at the right

are gathered together in the main stock room and moved by lift truck to the rack. One man operates either the stacker or the truck.

A large rack at one end of the shop is mostly used for castings. The individual bins are put in place and taken out with a stacker, except those nearest the floor which may be handled with lift trucks. High tiering is available but in many cases only two or three levels are used. Practically everything in the shop which is movable has skid bases to facilitate handling by means of stackers or lift trucks.

The great flexibility of this arrangement will be apparent. As conditions in the shop change, which they are constantly doing, the height or location of the racks may be changed. When a great deal of work is going through the shop the racks can be made high to accommodate the materials or parts required without congesting the floor space. They can always be placed where most convenient. If it is necessary to clear a certain part of the floor for a special assembly, say of a large unit, it is an easy matter to move the racks where they will be out of the way and yet where the materials that they carry are within easy reach. And all of this may be done with very little expenditure of time or labor, and the finished parts are always near at hand to the assembly points.

One of the most convenient arrangements is in connection with the large punch presses. The dies are kept on a rack adjacent to them. When it is necessary to change a die it is taken from the rack and placed on the press by means of a stacker by one man. This not only saves time and labor but practically eliminates danger of dropping the die and injuring it or the workman. Racks are similarly provided adjacent to the other machines for tools, jigs and fixtures, and also for different sizes, shapes and kinds of metal. These are always brought in and put in place with lift trucks or stackers but they are usually taken out by hand as only one at a time is used and no great weight is then involved.

One important consideration which must always be borne in mind is that the racks must be placed so that they can always be reached from an aisle or permanently clear space with room enough for the lift truck or stacker to operate. In order to make this the more simple the skid bases are made so that they may be lifted either from the ends or the sides, and need not be kept clear of obstructions from just one end.

Saved—$10 Per Thousand

J. D. RELYEA

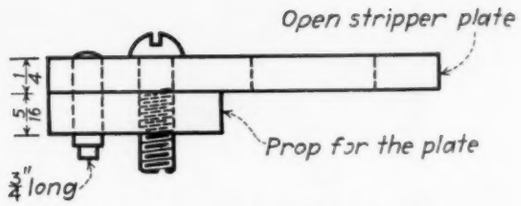
It happened this way. The end bearing of a cast-aluminum gyrator for a washing machine was being bored in an engine lathe. It was clamped to a 2-ft. faceplate, and the time-study man noticed that the highest speed on the cone pulley was not being used. He asked the foreman why not.

The foreman said, "It might cause chatter marks." The lathe operator chimed in with, "That big faceplate was never run at the highest speed and anyway it is too heavy for the lathe and the bearing might run hot." The time-study man persisted and said, "We will only ruin one tool and one gyrator by a trial. It means $10 per thousand. Let's try it." It was tried and there were chatter marks, but the highest speed was continued in use. The joker in this case was that a brass bushing was driven in afterwards and the marks did not mean a thing.

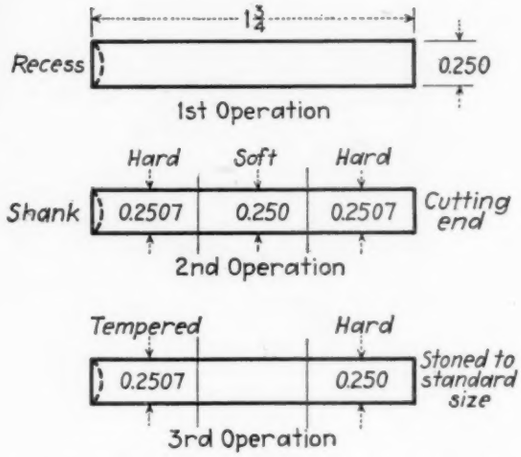
DIES depend on DOWELS

Screws and dowels are details of diemaking; but attention to details like these makes good tools—and earmarks good toolmakers

CHARLES WESLOW



If I want a standard size, hardened dowel, say ¾ in. long, I have to use one 1 in. long and grind it down because the ¾ in. length is turned off too much at one end



When I need a straight drill-rod punch I harden both ends, draw the shank and stone the cutting end down to finish size

WHEN I have piercing punches to make of straight drill rod, needing no turning, I harden the shank first and draw out the temper. This swells that end, and on a ¼-in. diameter it will swell 0.0007 in. Then I harden the cutting end, after which I stone down that end to its normal size. Thus, the punch will shove through a standard size reamed hole in the punch pad, but fit tight at the shank end; due to having drawn out the temper there, it is practical to peen it over so as to prevent pulling out. I always recess the end of the shank, so that peening will be easier.

If I use drill rod for dowels and there is no other reamer but standard size available, I harden the dowels, so as to swell them enough to fit tight in the standard reamed holes. On some dies, it is necessary to have dowels fit tight into the stripper plate but slide in the die shoe, so that the stripper is easily removed when about to sharpen the die; otherwise it may become necessary to remove the die from the shoe. It's best to have two dowels to hold the die in place, and drive the dowels say ¼ in. below the surface of the die. Then the dowels in the stripper will slide in the same holes to the same depth.

An objection to standard size hardened dowels is that it takes too long to stone them off smaller when necessary. Another objection I have to them is that they are turned off too much on one end, sometimes $\frac{3}{16}$ in.; thus that much of the dowel is useless, and it takes considerable time to grind that much away, before they are ready to drive in. The box in which they come may be labeled ¼x1½ in., but they are not 1½ in. long where they are to size because when turned off at one end they are that much shorter. Why manufacturers do this is beyond my comprehension.

The next length, the way they come, would be 1¾ in. in length—too long. Then these too have to be shortened by grinding them on the tool grinder. It's a nuisance. Very often there is just so much room for the length of a dowel and no more.

Often there is no more room for anything but ¼ in. screws in a stripper plate, and then is when much depends on dowels to help hold the plate secure; but if the dowels don't go down in at least ¼ in. they merely keep the plate from shifting.

Another complaint I have about standard hardened commercial dowels is they are not the size for a driving fit into a standard size reamed hole. Except in large manufacturing plants, all reamers to be had in the crib or laying around the foreman's bench somewhere, are either standard size or else worn down so much that a standard size dowel is useless unless a lot of labor is attached to it, stoning it in a bench lathe to suit the reamer. If the reamer is standard size, standard size dowels as they come from the manufacturer are not large enough in diameter to allow for a driving fit. It is not always necessary in some shops to lap the dowel holes in a die to a standard size, and it is not always advisable.

If I had anything to do with the manufacture of standard size hardened dowels, I would put them up in assorted sizes, varying 0.002 in., and see that they were as long on the polished

surface as the label on the box states. They should be tapered off on one end 0.0005 in. smaller and have both ends the same shape, slightly rounded.

If the dowels are ⅜ in. in diameter they are that much more of a nuisance, because the larger in diameter they are, the further up they are turned off on one end. I suppose the idea of turning them off on one end, is to make it easier for the diemaker to distinguish which end goes in first. Let me state that a diemaker does not need such advance notice. He makes them anyhow; mostly perhaps to see if one end is slightly larger, or more favorable to drive tight into the standard size reamed hole he has prepared for them.

There are manufacturing concerns who have their dies made with accuracy, which demands the use of hardened and ground and even lapped dowel pins, but such concerns are equipped with over- and undersize reamers that ream true to their size and are well kept. Try and find small tools like that in most shops today. I have my own reamers up to ⅞ in. and know what each of them does. Believe me I don't lend them out for others to dull up.

To do a nice job in doweling, it is necessary to have the holes in the die for dowels lapped 0.0005 or even 0.001 in. undersize. And if the dowels are, say, ⅞ in. in diameter, I use an old ⅞ in. drill that is much undersize, to spot the hole from the die, into the shoe and use an undersize reamer. Then I lap both die and shoe holes together to the size where the dowel will drive in tight. And by "tight" I don't mean the use of a large heavy hammer to accomplish such a fit.

I have seen some diemakers sock them in, much the same as some automobile mechanics sock in stay pins. I never put a dowel in without coating both the hole and dowel with machine oil. Otherwise they are likely to stick when it becomes necessary to remove them. And I don't drive in a dowel unless I clean out the hole with a narrow strip of rag.

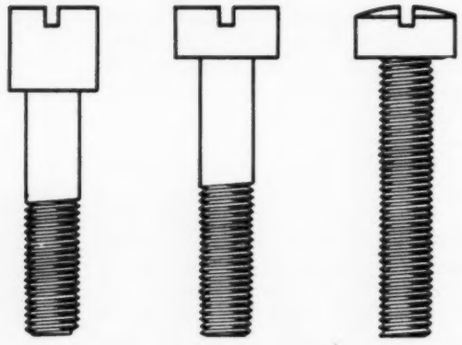
I had an automobile mechanic do some repairs on my car in my own garage, and wasn't he astonished when I told him that all screws and nuts had to be washed in a can of gasoline, and well oiled before putting them back in place. Not only that, but his hands and fingers had to be free from dust or sand. He thought I was nuts. But he turned out to be one of the best auto mechanics at the best pay. He told me some time later that I was the guy who "learned" him his trade and that his future employers marveled at his care. The customers wanted him and no other mechanic repairing their cars. Thus his pay was larger in both length and diameter. Soon as customers realize care is given their cars in repairing, they come back. Soon as they see care exercised in making their dies, they too, come back. No matter how "cheap" a die is to be made, the dowels should be considered most important. Otherwise, suppose the die or punch pad shifts? Then the punch will get sheared and that means considerable labor to grind off the cutting edge on the die and perhaps annealing the punch to peen it to fit the die again.

If I get a job sharpening or repairing or altering a die that someone else made, in which he used ordinary drill rod dowels, I mark which way the dowels were in and put them back again that way, because drill rod dowels very often are not straight unlike commercial hardened dowels.

If I make the die myself, I don't drive in a drill rod dowel, unless I check up on it and see if it is straight. If it is out too much, I throw it away and make another. But I mark them anyhow, because if they are put back different, the die may shift only 0.0005 in. which is enough to shear the punch if the die is made to cut thin stock. On heavy stock that is to be punched, then it doesn't matter, because the punch should fit loose to cut heavy stock; the pressure required to cut heavy stock is often enough to put such a strain on both die and punch, that either will shift enough to cause shearing. In a subpress die, the conditions are entirely different because a subpress is a built-in affair and is not provided with a shank that is fastened to the press ram.

When it is time to prepare for screws that are to hold the die and punch together, I first get the screws. Above all get the screws first. See what counterbores are available for the heads (I have my own). Use first a drill the size of the pilot on the counterbore, and start to counterbore say ⅛ in. deep. Then open the screw hole to clearance diameter and finish counterboring to suit. I never counterbore for screws in the punch pad so that the heads are below the surface. No sir, I leave the heads project out, and file or turn them so that they are flush

I have seen some diemakers sock them in, much the same as automobile mechanics sock in stay pins



Screw manufacturers should make special die screws like No. 2 with a larger and flatter head than the standard but without threads all the way up

with the surface. The surface then, together with the screws, contacts the ram of the press and keeps the screws from becoming loose from vibration. Counterboring so that screws hang below the surface is what I call a sloppy job. I have, on some occasions, tapped the counterbored hole for a jam screw, in which case I counterbore deeper. In my kit I possess 1/8 in., 7/64, 1/4, 9/64, 3/8 and 7/16 in. reamers—three of each; one of each is right to size; another one of each is 0.001 in. under, and the third of each size is 0.003 in. under. When I have to use hardened commercial dowels, I ream with the last size reamer first, and open up the hole with the next size. I try the dowel and see if it fits that reamer. I don't go right ahead and take it for granted that everything will come out all right.

Many a diemaker has come to me to help him out when he got to assembling his die, because of the loose fit of the dowels. All I could do for them was suggest making dowels of drill rod and harden them so that they could swell enough in hardening to fit tight. But I would add, "Make sure the dowels are not warped out of shape, and that if they are, make new ones, until they happen to harden straight." But it doesn't need to just "happen" that way if they are careful in heating them evenly and at a very low heat, immerse them into water containing dissolved cyanide and coat the hot dowel with the same material before quenching.

I have seen some diemakers use old parallel clamps to hold the punch pad to the cast iron punch holder preparatory to lining up. Such old clamps should not be used unless they have been straightened. It's a shock to me to see clamps bent up like a crowbar, being used by some diemakers, who I believe are too much of a cheapskate to buy even a corkscrew for their buffet.

And such screwdrivers some of them have. They resemble an ice pick. Pointed from wear, causing them to slip out of the screw slot, which gives the slots a shocking appearance—all bunged up. Sloppy work.

But the worst is yet to come. That's when some of the die repair men get their nippers on the job. They invariably use a chisel and hammer to tighten the screws, hammering away at the screw slot with the chisel, so as to prevent the screws from coming loose —such iniquity. It is well known that a screw thus becomes tighter, because tapping with hammer sets up a vibration, and it is between the vibrations that the screw has a chance to turn a little more. On the other hand, vibration can be caused by tapping the die in the shoe, while the screwdriver is at work turning the screw.

Screws with a body come with a certain size head; a 1/4-in. filister head screw has a head 3/8 in. in diameter. Another kind of a screw, which is threaded all the way up to the head, has a head 7/16 in. in diameter. The latter screw can be tightened easier, because a wider screwdriver can be used, thus giving more leverage to the screwdriver; besides the latter screws have heads that are not so long as the screws having a body. Very often the body screw heads must be turned shorter and a new slot sawed in them, because there is no room for a long head, especially when the screws hold a spring stripper in place, which actuates the screws up and down in the punch pad.

Manufacturers of screws should specialize in the production of what I would call die screws. I would produce them in a screw machine, with the usual body, but larger head, than those of standard size today. I compare my idea of such screws with those that are now put up for all around use in the accompanying sketch.

No. 3 is the screw which can be had with the thread all the way up to the head, but it is objectionable because the threads are rolled or perhaps pressed like a drop forging, and they do not fit so tight in a standard size tapped hole. However, if the hole in a die is not tapped with a slightly oversize tap, the hole will shrink in hardening, and then the No. 1 screw has to be rethreaded with a threading die. In that case I get screws that are about 1/2 in. longer than I need, so that I can hold the end of the screw, instead of the head, in a vise while I rethread and afterward saw off the surplus length. Holding the head in a vise for such an operation distorts the head all out of round.

No. 2 screw (my design) should be made undersize for just such a reason. So let's have die screws and labeled as such, instead of the Tom, Dick and Harry kind, which I regard as No. 1.

They can be stocked until it becomes necessary for the diemaker to use them. I would also approve of heat-treating the die screws I suggest for more strength. Die screws were made out of tool steel by apprentice boys in the toolroom of the old Western Electric Company in New York when I worked there in 1899. How could I ever forget the great care that was exercised in that toolroom under the able supervision of George Ficke, and his assistants, Carew, Powers, Tortupp and Hubbard. I bow my head in reverence to those executives of that period. I wonder where they are now?

Only recently I met a man who had been a foreman in the Pierce Arrow plant, in Buffalo, who told me that John Guider now owns a $500,000 interest in that concern. Mr. Guider was employed in the old Western Electric toolroom the same time I was; but six years later became an assistant foreman in the Pierce Arrow plant. (Pretty soft for some people). There wasn't any difference in ability between John and me, but there was a vast difference in our physical and psychological make up. He was well built, full face, and a good gabber. While I was tall, slim, thin faced and a very quiet non-gabber. I had to keep working at the bench, except in a few shops, but John got ahead, mostly because he looked like an executive and talked like one. I didn't look like one, and I didn't talk like one. I'm happy though except for one thing and that is, I have been on my feet too much in my life's work.

I think my next job will be "flagpole sitter." I will then put my tool kit on permanent exhibition in the Smithsonian Institution and placarded, "Here's the kit of a rolling stone that gathered no moss."

CULEBRA in the CUTTING

VIII—Whether he's salvaging shovels for the Big Ditch or keeping rolling stock rolling, the maintenance man must often make the best of makeshift machines

FRED H. COLVIN
Editor

ONE of the most interesting trips of my long editorial experience was to the Panama Canal Zone in 1911, while it was in the making. I went down on a small German fruit steamer the *Prince Joachim*, which incidentally went on the rocks on the next trip. We (for I was accompanied by a young editor from *Engineering News-Record* as well as a personal friend, Nathan Rockwood) dropped off at Colon, or Christobel; and went to Panama while the steamer made its regular 10-day trip to Central American ports. I spent the time in the shops along the Canal. The newspapers were full of the digging activities, but no one told about the machines behind the work. So I went down to have a look.

This gave us a chance to meet General George Goethals, in command of the Zone, at his office in Gorgona, a town that is now at the bottom of Gatun Lake. The General was kindness itself, gave us a pass to go anywhere on the railroad or in any other way and sent us out for the first afternoon on his own inspection car. And that was *some* ride. Coney Island's roller coaster has steeper grades and higher speed, but dodging long trains of dump cars that were carrying the "spoil" from Culebra Cut to build the Gatun dam, had thrills of its own. Dirt trains had the right of way, everywhere. The General's inspection car and passenger trains waited as patiently as possible on sidings while the long trains of dirt went on their "damward" way. And patiently or not, they waited. The work had to go on.

The passenger train left Panama about 6:30 a.m. with me on board, headed for the first shop, Gorgona, for here they kept the locomotives and cars in order. Here were 1,800 men whose sole job was to keep the rolling stock rolling. There were over 300 locomotives and hundreds of cars, all subjected to unusual wear and tear on temporary tracks, under the best conditions. At worst they rolled over in the mud which meant a general overhaul.

From here I tramped to the next shop and studied the work there, taking photographs and getting facts for the articles. In this way I tramped many miles of the canal on various days, in spite of rains that came without warning and went as suddenly. In this way I saw abandoned parts of the old French canal; French locomotives lost in the jungle with huge trees growing through and out of the cabs; old machines that had been used and left to their fate. One fact stood out, how-

ever, the lasting quality of the old French corrugated *iron* roofs. Some of these had been used many times, as shown by nail holes between the present rafters. But *steel* roofs corroded —and vanished like dew before the sun.

At the Empire shops, now also covered by Gatun Lake, was the shop for repairing steam shovels. Here 1,200 men overhauled the engines, repaired brakes, put new claws or teeth on huge grab buckets, and put them in condition to "make the dirt fly." Work varied from minor repairs to complete rebuilding of shovels which had been wrecked by slides in Culebra Cut or other serious accidents.

Work on the dam and the locks was also of interest for the first of the great gates was being put in position while I was there. And sixteen years later I had the privilege of going all through one of the completed locks that was being overhauled. I climbed down 150 ft. of ladder built into the sides of the lock, in high boots and with the camera, explored the huge conduits as large as railway tunnels and saw how well the whole job had worked out.

At the Pacific end of the Canal is Balboa, which is in the Zone, and joins Panama City. Here there was a collection of the French dredging equipment. The dredges were very good, so far as they went, but some of the machine tools in the shop were of ancient vintage.

Scot Kept Dredges Working

In charge of the dredges was James Macfarland, a Scot who knew dredges inside and out and kept them hard at work deepening the Pacific end of the canal. I met Mac again on my second trip, but in Cuba, not in Panama. As Mac told it, he stuck by the Canal until the War came. Then, not being a citizen of the USA he came under the ban and resigned. I next saw him in Sagua de Grande, in the interior of Cuba, where he had a good sized shop that repaired sugar mill machinery for miles around. He and his son were both excellent mechanics who could fudge up ways of making emergency repairs that saved the mill owners money by keeping their shutdowns at a minimum. And in the sugar grinding season every day lost runs into real money. I saw them build up four corners on a 12-in. shaft to make it fit the square driving muff or coupling, because no steel for the roll could be had without great delay.

Here I found the only Sellers planer I ever saw with the rack worn out. It had been badly abused by overloading both as to weight and heavy cuts until finally the rack gave up the ghost. No one knew how many times the planer had changed hands. The next time I was in Sellers' plant I found that this planer had been built in 1856 —and this was in 1927, which was some length of service.

This recalls a railroad shop in the far west that had an old Sellers axle lathe, one of those with the headstock cast on one end of a tubular bed that resembled a small sewer pipe. I don't know how long this lathe had been in operation, but the master mechanic had a standing offer of ten dollars to any man who could smash the lathe in actual service. He wanted a new lathe and felt that it would be worth ten dollars of his own money to be able to say the old one had given out at last—so he could order a new one.

Didn't Await "Thank You"

A somewhat similar story was told me by another railroad master mechanic. He had an old boring mill that was a constant source of trouble, but the man up above couldn't be induced to buy a new one. One night a tramp machinist, as we used to call the men who flashed from one job to another, fell asleep; the tool fed too far, caught in the work and played havoc with the machine. The crash woke up the man who took one look at the wreck and beat it without waiting for his pay.

"He needn't have skipped," said the master mechanic. "I wouldn't have fired him. I was so darned glad to have that machine smashed I might have even raised his wages a bit."

Four other railroad shop experiences also come to mind. One in the South many years ago, where the old master mechanic took me through and reminisced a bit himself. He had been 40 years on the job in that one shop, though not as master mechanic all that time. He pointed out two machines as being the only ones that were not there when he came.

Penny-wise Economy

Another shop superintendent in the far West pointed with a show of pride to a milling machine that had seen over 40 years' service, and that was at least 15 years ago. He did not seem to realize that this gave far more credit to the builders of the machine than to the management of a shop which thinks it economical to keep on using machines built before the days of high-speed steel.

The third incident was at the western terminus of a road that had spent millions in electrification, including huge electrical locomotives. I noticed the commutator of an armature being turned on a lathe that was not familiar. Inquiry revealed the fact that it was built in the shop because the management would not appropriate money to buy one; and without it the new locomotives could not have been kept in service.

The superintendent stated freely that it had cost more than a standard lathe for this work. But he had to have it and so juggled it into the maintenance column in his bookkeeping. This is only one of hundreds of cases where the purse strings are held by men with no knowledge of practical requirements or actual costs. A dollar saved looked good in their reports even if it cost two dollars in the total of operating expense. Nor are the railroads the only industries in which this situation prevails. Some of the accounting methods of even the modern automobile industry are not much better.

One railroad shop master mechanic, in the days when the M.M. was monarch of all he surveyed (and shop superintendents were still unknown in the railroad shop) had a unique routing for his apprentices. Instead of following the time worn custom of giving them the most monotonous job in the shop, such as running a bolt cutter or cleaning out pits, he put them with the erecting gang. And his reasoning was sound, I think.

It ran something like this:

Starting Boys Right

"It's a bit hard on any boy to buckle down to 10 hours a day, (as it was then) and the best way to bust his spirit is to give him such a job as running the bolt cutter. So I put him with the erecting gang for a month or two. And it pays.

"He does errands to the tool room and to the store-room and saves a man's time. But best of all, he learns something of what it's all about. He learns the names of the locomotive parts and what they do. He learns the names of the tools. He sees what parts have to be a good fit and those that require clearance or play. Then when he goes on to the lathe or other machine he has a general idea of the importance of having the work right for that particular job. My boys get to the point where they earn their keep a lot sooner than in some shops I know of, and it's because I start 'em right."

I've always felt there was sound logic in his plan and that the idea could be followed to advantage elsewhere.

"SINK HOBBED"

GEARS

Oil-pump and distributor drives of automotive engines employ these gears, and their simplicity and convenient cutting will recommend them for other uses

ROLAND V. HUTCHINSON

HELICAL GEARS connecting non-parallel shafts are frequently used in accessory drives. Often it is desired to locate one gear, say midway along a shaft, and to have some flanges or other interferences near it. Sometimes it becomes necessary to cut one gear in a bearing.

The customary method of cutting is to use a narrow single-start hob of suitable diametral pitch, fed radially toward the work axis. For identification this method is called "sink-hobbing." The resulting gear is not helicoidal but will, within limits, run satisfactorily with a mating involute helicoidal gear or pinion.

Complete analytical treatment of the case is laborious. Satisfactory notions of the resulting phenomena may be obtained by discussion of limiting cases, the actual work produced lying intermediate of such limits.

A spur-gear hob approaches a slab mill as a limit as the diametral pitch of the hob increases without limit. In Fig. 1, a slab mill of radius r_c, acting as a generating cylinder, will generate a spool-shaped quartic of revolution when the included angle between projections of cutter and work axes into planes parallel to both is κ and $\kappa > 0$. In any plane such as BB, the spool intersection will be circular, of radius ρ, and tangent to the intersection of the cutter cylinder, that is, tangent at P_3 to the ellipse shown. Parametric equations locating P in terms of C, r, κ and z are easily set up, which show the surface to be of fourth order, and the illustrated projection of the contact locus to be a quartic spiral with the projection of the cutter axis as tangent at one inflexion.

Four limits for the spool are as follows:

(a) When κ is zero the spool is cylindrical.

(b) When r_c is infinite the spool is cylindrical.

(c) When κ is $\frac{\pi}{2}$, the spool is toric.

(d) When $r_c = 0$ and $\kappa \neq 0$ the spool is a single-surface hyperboloid.

For all four of these limits the projection of the contact locus is linear, along the axis for (a), (b) and (d), normal thereto for (c).

Consider Fig. 2, illustrating limiting case (d) isometrically, and treating of point P on one generatrix of the hyperboloid.

Here $r_c = 0$ and κ lies between 0 and $\pi/2$.

Coordinates of P are ρ, ζ and z, and $\zeta = \cos^{-1}(c \div \sqrt{z^2 \tan^2 \kappa + c^2})$.

FIG. 1

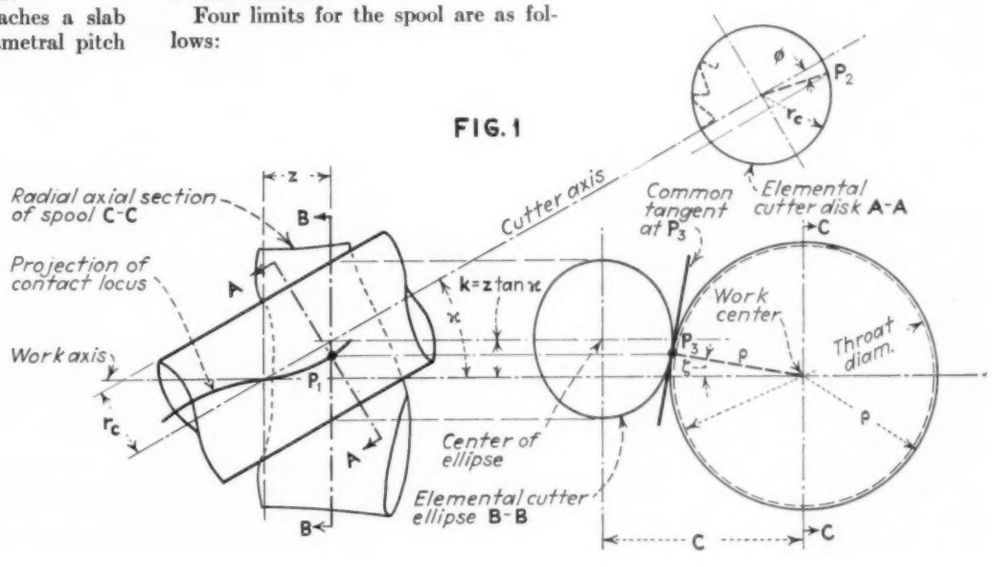


Fig. 1—If a cylindrical cutter is assumed, it will generate a spool-shaped work piece when both elements are rotated. When the pitch of the cutter teeth is zero the contact is that between a cylinder and spool

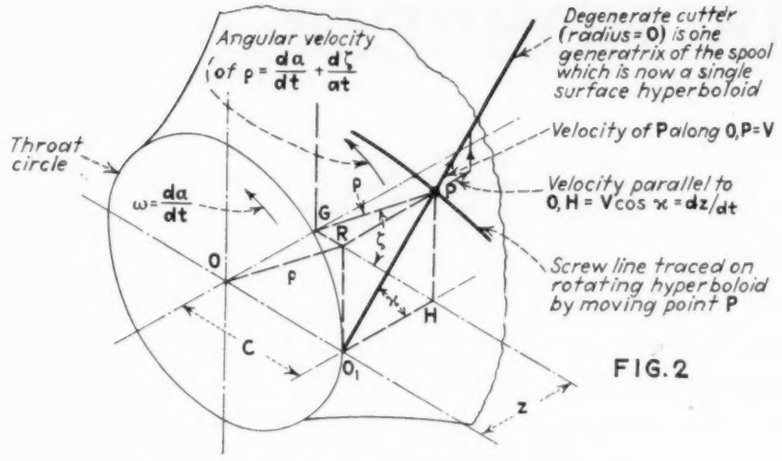

Angular velocity
of P = da/dt + dζ/dt
Degenerate cutter (radius = 0) is one generatrix of the spool which is now a single surface hyperboloid
Throat circle
Velocity of P along O,P = V
ω = da/dt
Velocity parallel to O,H = V cos κ = dz/dt
Screw line traced on rotating hyperboloid by moving point P
FIG. 2

Fig. 2—As a special case of Fig. 1, the screwline traced on a hyperboloid is right-handed, and the instantaneous lead increases from minimum at the gorge of the spool

Consider the spool stationary and point P to move along the generatrix with uniform velocity V, when the velocity of H along O_1H is $V \cos \kappa = \frac{dz}{dt}$, and ζ changes at non-uniform rate.

Now, additionally let the spool itself rotate uniformly around its own axis, with angular velocity ω; and point P traces a screwline on the spool surface.

Defining instantaneous lead of a screwline as ratio of time rate of change of axial position of its generating point to time rate of change of its phase angle in a plane normal to the axis, screwlines as above generated are of systematically varying instantaneous lead.

When ω and V are both uniform, this function is proportional to $(dz/dt) \div (\omega + d\zeta/dt)$, itself variable, for on eliminating dt, $d\zeta/dz$ remains variable.

With motions as illustrated, the screwline is right-handed, and the instantaneous lead increases continuously from minimum at the gorge of the spool; if both motions be reversed, instantaneous lead decreases continuously from maximum at the gorge.

Imagine the taper attachment of a lathe set to turn a cone with small diameter toward the tailstock, geared to cut a right-hand thread, and with a V-tool set vertically instead of horizontally as is usual. With forward motion of the lathe a right-hand screwline of instantaneous lead increasing from the throat will be cut. Other possibilities are easily argued, consequent to arbitrary changes in taper attachment setting or reversal of leadscrew.

Applying this type of reasoning to the hobbing case, the radial axial sections of enveloping helicoids of the hob-cutting edges act as rotary comb chasers to remove excess gear material. Points on their elemental helices (*AM*—Vol. 79, page 454) size-cut at a series of osculation points comparable to point P of Fig. 1. Phase angles ϕ in the diagonal projection of Fig. 1 exist in the hobbing case, and the projection of the contact locus there shown becomes in reality the projection of a contact surface built up of such loci or portions thereof. The time rate of change of any ϕ pertaining to any elemental tooth point helix is variable, exercising an influence upon the instantaneous lead of the work surfaces somewhat similar to that of ζ in Fig. 2.

Individual angular velocity components being superposed, the resulting gear is spool-shaped and of non-uniform instantaneous lead. When hands of hob and gear being cut are unlike, the instantaneous lead cut increases with departure from the gorge and vice versa.

When finally sizing the gear, centers are constant, the values of r_0 include both tip and root radii of the hob teeth. The effect of a range of values of the ratio of r_0 to center distance is to alter the change of instantaneous lead cut at different depths of the tooth, whence the radial axial section of the gear as cut yields teeth tilted toward the transverse plane through the gorge.

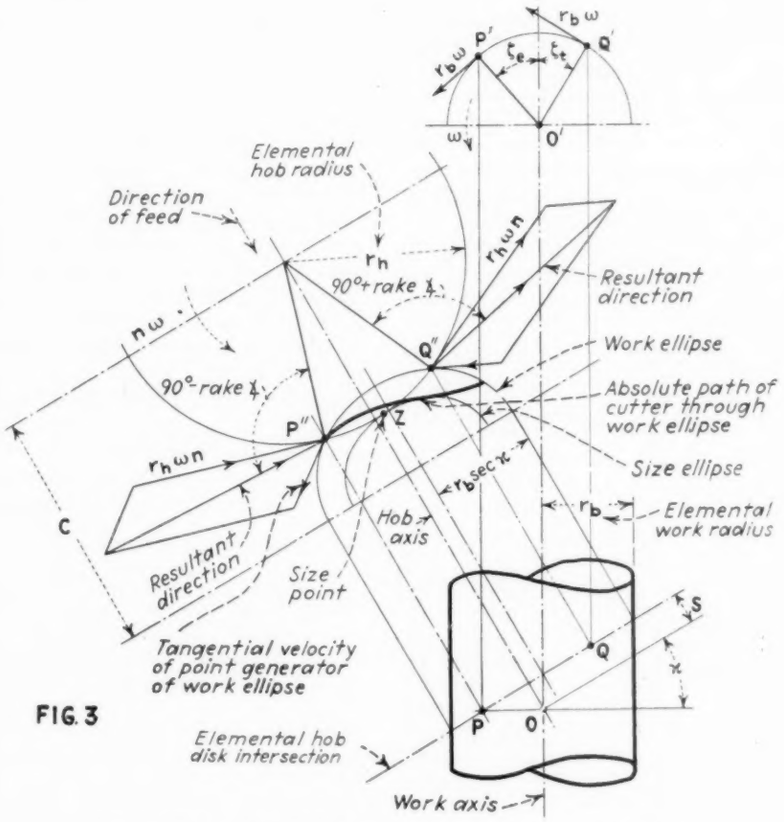


Fig. 3—With work and hob of like hand the hob cutting edges and the work move in substantially opposite directions when resolved into the transverse plane of the hob, thus being favorable to satisfactory surface finish

When the hob radius increases to infinity, the hob becomes equivalent to a rack-shaped planing tool and the gear approaches the helicoidal state as a limit.

Using involute hobs, sink-hobbed gears are intermediate of what could be produced by a suitably guided chasing tool, i.e., hyperbolic spiraloidal, and involute helicoidal gears.

The above described tilt effects are independent of pressure angle of the hob used.

Variation of both instantaneous lead and tilt of teeth are both reduced as the hob diameter increases with respect to that of the workpiece. Often the hob diameter is easily made 1¾ times the workpiece diameter. Neighboring axial interferences limit hob diameters quite rapidly.

Relief and Gashing of Hobs

Examination of necessary relief and optional gashing of hobs is simply done by vectorial treatment of velocity components of relative motions of work and hob, in planes normal to and including the hob axis.

My treatment (*AM*—Vol. 78, page 503) was a special case of this kind. In the present Fig. 3 we have the usual, and from the surface-finish standpoint, the preferable case of hob and work of like hand, so the hob-cutting edges and the work move in substantially opposite directions when resolved into the transverse plane of the hob. The work has angular velocity ω, the hob has $n\omega$, and the section is taken through any elemental hob disk.

The work intersection with this plane is elliptical, its major and minor axes $2\ r_b \sec \kappa$ and $2\ r_b$, the hob elemental radius is r_h and the center distance C. Infeed is here neglected as of inconsequential size, and when finish cutting to size is zero, for C is then a fixed dimension.

The hob passes through the arculate path $P''Q''$, interfering with stationary work between these points.

The tangential velocity of points on the elliptical work-section is obtainable by projection from the top view of the workpiece, the direction of the tangent being obtainable by constructions given in both Marks and Hütte. Hence velocities at P'' and Q'' and obtainable, hence the directions of relative cutting. Rake making for keenness is considered positive, explaining the signs + and − in rake-angle dimension. "Size-point" Z is the point of tangency of the work size-ellipse with the elemental hob circle. The diagram is not to any particular scale.

Resultants give directions with respect to which mandatory radial relief must exist and optionally variable top rake may exist.

The absolute path of the point on the hob disk referred to workpiece as datum affects the theoretical irregularity of the work surface produced, for this latter is a series of intersecting envelopes built up of the surface-elements produced as described.

Cutting, in the element, starts at P'', movement of the workpiece toward the moving cutting point delays its radial penetration into the work.

The absolute path may be inflected; in any event the hob emerges from the work beyond Q''. The final work surface is made up of a number escalloped facets, the angular interval between which when projected into a transverse place of the work is

$$\frac{2\pi}{n \times N_g} \text{ (radians)}$$

for axially gashed hobs, or

$$\frac{2\pi}{n \times N_r} \text{ (radians)}$$

for helicoidally gashed hobs, N_g and N_r as defined (*AM*—Vol. 78 page 467) and n the ratio of workpiece teeth to hob starts, for the single-start hobs considered equalling the former.

The closer the absolute paths approach coincidence with the size-ellipses the smoother the surface finishes.

Greatest radial relief is demanded by the condition $S = 0$ in the lower view, the line PQ then including point O.

Fig. 4 illustrates the case where hob and work are of opposite hands; the absolute path lying between P'' and Q'', the escallops are relatively deeper and the final surface obviously rougher.

Treating next of axial conditions, Fig. 5 shows (dotted) a left-hand hob cutting behind a (solid line) right-hand gear. The front of the gear moves from left to right, the front of the hob diagonally downward from right to left and the basic rack of the hob diagonally downward from left to right, conditions for surface finish being less favorable, as in Fig. 4.

Neglecting the superposed ϕ effect in cutting, the rack movement is superposed upon the "axial-of-the-hob" components of motions of points in the gear blank. Such components are due to the angular setting of the hob spindle H, (the usual hob spindle angle

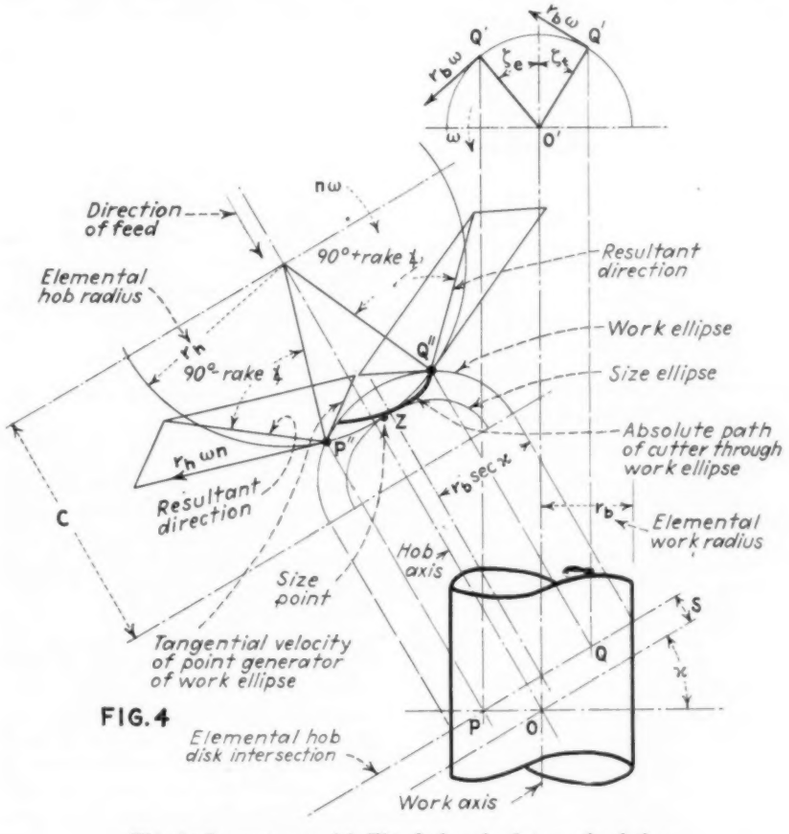


FIG. 4

Fig. 4—In contrast with Fig. 3 the absolute path of the hob is less favorably disposed toward good surface finish when the work and hob are of unlike hand

as read directly on the hob swivelhead, and the complement of κ), and are maximum for maximum workpiece radius at the center of the blank, assuming the latter turned cylindrical as is usual. Combining these components with the tangential velocity of the hob tips, one finds the direction with respect to which mandatory axial relief must, and optional axial rake may, be arranged.

Let p be the diametral pitch of the hob, r_h its tip radius, r_g the outside radius of the gear, κ the inclination of hob spindle from parallelism with work axis, and n the number of teeth being cut with a single-start hob.

The angular velocity of the work being ω, arbitrarily given the value of 1 radian per second, the hob-tip tangential velocity is $n\omega r_h$ or nr_h and the axial velocity component due to shift of basic rack is $\frac{n}{2p}$ (for the axial pitch of the hob closely approximates $\frac{\pi}{p}$, hence the axial velocity is shift of basic rack per radian work rotation per unit time, i.e.

$$\frac{n\pi}{2\pi p} \text{ or } \frac{n}{2p}$$

Axial velocity due relative inclination of the workpiece is $\omega r_g \sin \kappa$ or $r_g \cos H$, where H is machine setting angle, complementary to κ.

Direction of cutting at the tips when just touching the blank is

$$o\beta_s = \tan^{-1}\left(\frac{r_s \cos H + \frac{n}{2p}}{nr_h}\right)$$

reducing to

$$o\beta_s = \tan^{-1}\left(\frac{2\,r_s p \cos H + n}{2r_h pn}\right)$$

the helix angle of hob tip for zero axial rake.

For hob and work of like hands consider hob hand and rotation of gear blank both reversed in Fig. 5, and we have

$$o\beta_s = \tan^{-1}\left(\frac{2r_s p \cos H - n}{2r_h pn}\right)$$

As in the worm-gear hob instance, if relief be satisfactory both radially and axially at the hob tips, it is adequate down to the roots of the hob teeth. Gashes are of opposite hand to that of the hob-tooth thread, and choosing any desired tip helix angle β_g, for the gash, to give desired side or axial rake to the entering flank of the hob tooth, the requisite gash lead is again $L_g = 2\pi r_h \cot \beta_g$, when β_g is measured from the hob axis.

Application to Cutting

Maximum smoothess of possible surface finish due to escallops produced by the hob is:

(a) Independent of infeed rate so long as finishing is done on fixed centers.

(b) Increased by cutting gears with hobs of like hand.

(c) Increased with increase of number of gashes in the hob.

(d) Increased with increase of hob diameter.

(e) Diminished by both runout and wobble of the hob as installed.

When stringy material such as S.A.E. 1020 steel is cut, surface imperfections may exist as torn surfaces superimposed upon escallops. Substitution of suitably gashed hobs makes possible reduction of such tearing on one flank of the tooth produced, and improvement is available for unidirectional drives. Such smoothing is transferable from one set of flanks to the other when chucking limitations do not prevent, by turning the work end for end in the hobber. Failing this, rotation of the whole machine may be reversed.

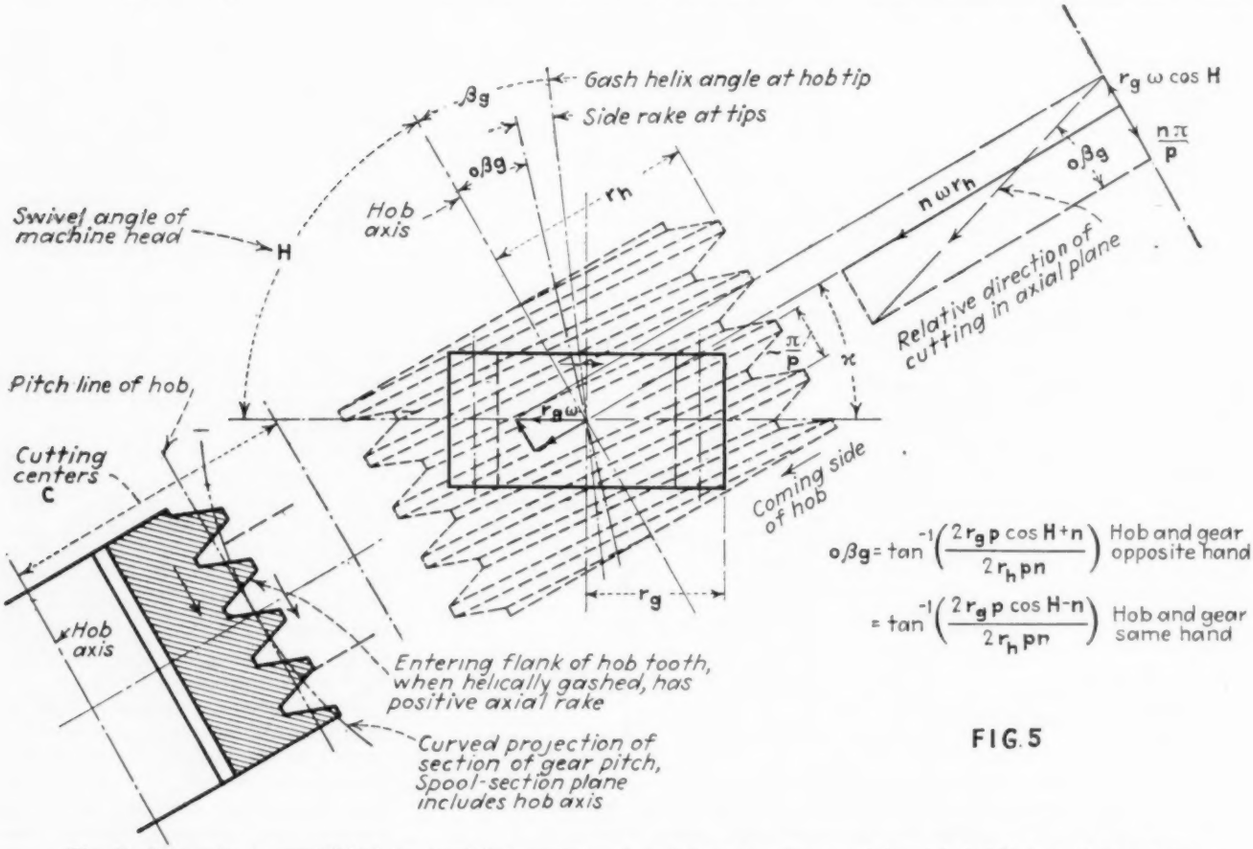

Gash helix angle at hob tip
Side rake at tips
βg
oβg
rh
Hob axis
Swivel angle of machine head
H
Pitch line of hob
Cutting centers C
Hob axis
Entering flank of hob tooth, when helically gashed, has positive axial rake
Curved projection of section of gear pitch, Spool-section plane includes hob axis
rg ω cos H
nπ/p
oβg
n ωrh
Relative direction of cutting in axial plane
π/p
x
rg ω
Coming side of hob
rg
oβg = tan-1 (2rg p cos H+n / 2rh pn) Hob and gear opposite hand
= tan-1 (2rg p cos H-n / 2rh pn) Hob and gear same hand

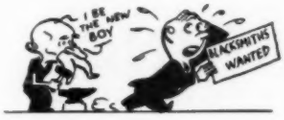
FIG. 5

Fig. 5—Side rake is established by graphical analysis of a left-hand cutter used in sink hobbing a right-hand gear

Talking Shop

No More Blacksmiths?

While most of the work in the manufacturing shops can be done by unskilled workers trained to do a particular job, there are key positions that can't be handled that way. Take blacksmithing, for instance. In an oil field repair shop the blacksmith is an important man. He is the forge department and the heat-treating depart-



ment rolled into one. But blacksmith colleges are rare, and students are scarce.

A chain of oil tool repair shops in Kansas employs five blacksmiths, one in each shop. The youngest is 64. If Dr. Townsend had his way there wouldn't be any. What the head of this company wants to know is where he can get more smiths when Father Time or Dr. T. removes his present force.

West of the Mississippi

Machine shops west of the Mississippi have most of the troubles found in shops farther east, and some special ones of their own. Out there you don't hang out a help wanted sign and wait for the toolmakers and machinists to troop in. (That method hasn't been howlingly successful in the East lately, but it used to work.) Instead you bring in a few likely cotton pickers if you're far enough south, or farmers if you're farther north, and the foreman "breaks them in." This method has its disadvantages, of course, but it does have at least one advantage—these men don't know all the things that can't be done. A good many times they just go ahead and do them.

With help of this type safety rules have to be extra safe, and rigidly inforced. Take one big Texas shop as an example. Every man who ever uses an air hose has to wear goggles when he uses them and keep them around his neck in between times. If he damages an eye in spite of these precautions he is in for a private session with the superintendent, who, having spent some of his early years in Bohemia, is entirely capable of talking to him "like a Dutch uncle."

Here's another example. Every person, man or woman, on the assembly line of a Missouri plant is required to wear glasses while at work. The company supplies the glasses. They are ground to the individual's prescription if he has to wear glasses normally.

A Little More Stock

While the repair shops are still pretty much in the blacksmith era the manufacturing shops are well beyond it. There was a time, not so long ago, when their plight was like that of the old-fashioned civil engineer in the days when reinforcing steel was first added to concrete, who played safe by design-

ing his structures so that there was enough concrete in them to carry the load regardless of what the steel did. Engineers in the oil fields admit that oil well equipment has been in somewhat the same state. Still following in principle a design that was intended for light tools working in what would now be considered shallow holes, more recent tools reached a ponderous size. Each failure or threat of failure was met by adding a little more stock. Engineering is now entering the picture, and with it a generous use of alloy steels. Improvement is inevitable.

Useful Ashes

If we had a "Believe it or not" column this item would go into it. It was unearthed by our subscription man in Kansas, and just goes to show that the good in *American Machinist* is lasting. One of his clients had the trick of

piling up copies of the paper after he had finished reading them, on the chance that he might want to refer to something some time. When the pile threatened to squeeze the desk out of his office he suddenly discovered by consulting a jeweler friend that paper ash makes an excellent silver polish, and that *American Machinist* ashes are of unusually high quality. When last visited his office contained only one or two late copies but his friend had a good stock of prime silver polish which he was selling for 50 cents a packet.

Gabfest Business

A successful works manager has a foremen's room near his office. About an hour after work has started most of the foremen drift in there for a smoke and chat. If they come he knows that everything is running smoothly in their departments. Incidentally they do a tremendous amount of business at these informal gatherings.

The Editors.

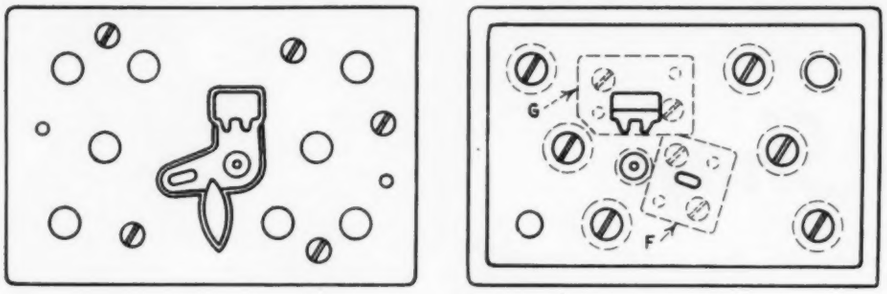
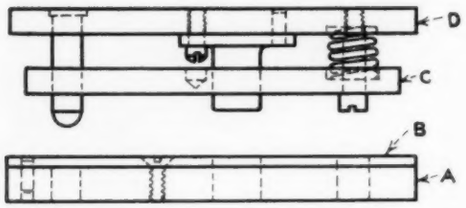


Fig. 39—No back-up shaving punch is required here because the nest plate and piercers give sufficient support for the part

FIG. 39



IX—Shaving dies are used for two reasons; to obtain either greater dimensional accuracy or a better working surface

DIE DESIGN and DIE MAKING

E. G. MARSHALL
Master Mechanic, Charleston Works
The American Fork & Hoe Company

THE edges of blanks are left rough and tapering as a result of the clearance required between the original punch and die. This is particularly true of thick stock. Smooth, square edges are produced by shave dies because the opening is made exactly to the required size and the punch is a snug sliding fit. In some cases the entire contour or periphery of the blank must be shaved, in others, only small sections which must be in definite locations or which must provide a bearing surface. A back-up punch opposite the shaving punch is advisable where only a small section is to be shaved, in order to prevent the part from slipping sideways and leaving a tapered edge.

The designer should lay out the part so that the burr will be on the same side as the pierce and blank burrs. On the blank die he should show dotted lines at the points shaved, and also for the back-up shave. There should be a note that shave must be allowed for, giving the amount to suit the thickness. Use 0.008 in. shaving allowance for ⅛-in. stock as standard. It is assumed that the blank die is made with a 5 per cent clearance.

A low-production shave die, shown in Fig. 39, is made in much the same way as the low-production pierce die, Fig. 15 (*AM*—Vol. 80, page 377). It is used between planish blocks. Die block *A* is made of tool steel. The piercing openings are machined to size plus allowances made to suit the thickness of the stock. The walls have a ¼-deg. taper on each side. In contrast, the shave opening is made to the part-print size and the die walls are left straight. Screw and dowel holes for the nest plate are put in before hardening. Clearance is allowed for the stripper screw heads.

The nest plate *B* is made of hardened tool steel in order to obtain sufficient strength to support the part. If a back-up shave punch had been used, cold-rolled steel, case hardened, could have been used instead. The nest plate is fitted to the blank with a light tap fit. A pick-out groove is cut in the nest and die block. The nest plate is located and fastened to the die block with 8-32 flat head screws and $\frac{3}{16}$-in. dowels.

Stripper plate *C* is made of ⅜-in. cold-rolled steel and attached to the punch plate with shoulder screws. The springs are under an initial compression of ⅛ in. A snug sliding fit is used in the stripper plate around the pilot pins and the piercers, but not around the shaving punch because the stripper does not guide this part. Finally a blank is riveted to the stripper to make up the difference in thickness between the part and the nest plate.

In punch plate *D* are driven the two pilot pins. This plate is ⅜ in. thick, made of cold-rolled steel, and the stripper screws are screwed into it. The round piercer is driven in; other punches are mounted on the bottom face.

Slot piercing punch *F* is screwed and doweled to the punch plate, to prevent the peening of the punch in order to line it up. Shaving punch *G*, made of hardened tool steel, is also attached to the punch plate with screws and dowels. This has a heel that enters the die block before the cut starts. The punch is a snug sliding fit in the opening in the die block.

This type of die will produce more

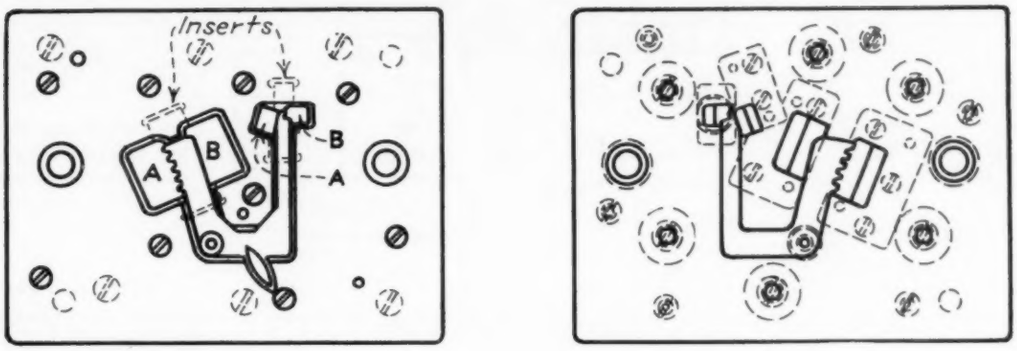


FIG 40

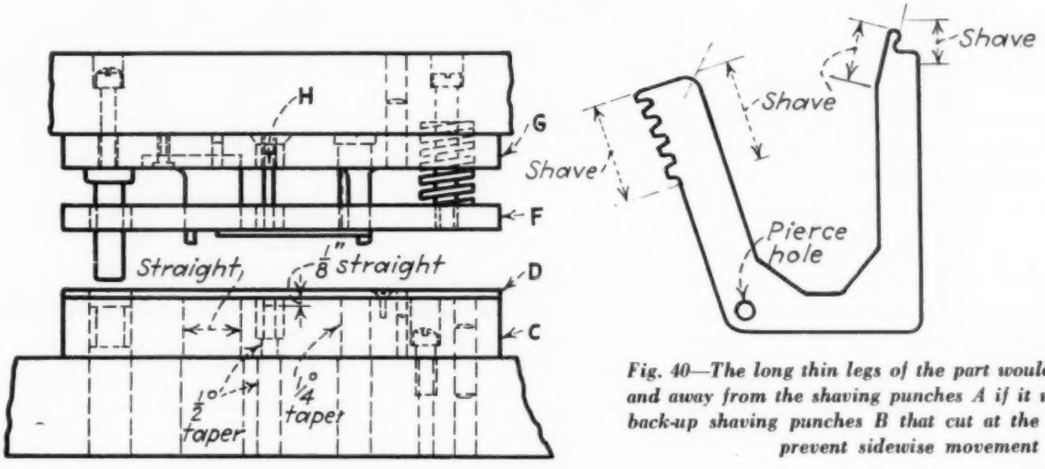


Fig. 40—The long thin legs of the part would spring inward and away from the shaving punches A if it were not for the back-up shaving punches B that cut at the same time and prevent sidewise movement

accurate work if it is mounted on a cheap sub press. If this is done add screw and dowel holes to the die block before hardening and also to the punch plate.

An example of the use of back-up punches is shown in the high-production mounted shave die, Fig. 40. At *A* are the regular shave openings, and at *B* are the back-up openings. The punches are mounted directly on the upper member and the stripper is not piloted. Because of the one pierced hole required in the part, it is necessary to add the punch plate and the pilot pins.

To minimize wear because of the back-up punches, tool steel was selected for the die block *C*. After it is shaped to size and the top ground and laid out, the punch plate and the stripper are clamped to the die block and holes bored for the pilot pins and piercer. Next, the openings are made for the inserts. The portion of the openings not in the inserts are finished to size. All screw and dowel holes are put in, the die block hardened and the top and bottom surfaces are ground to level up. The inserts are then machined for a drive fit. They are colored, laid out, then removed and machined to size, hardened and driven back into the die block. The openings can then be stoned and finished to size.

Nest plate *D* is made of ⅛-in. cold-rolled steel and hardened. It is fastened to the die block with 8-32 flat head screws and $\frac{5}{32}$ in. dowels. The opening for the blank should be fitted to the blank itself and not made to the part print. The top edge is beveled for easier loading. A pick-out groove is added to remove the part.

Stripper Plate

Stripper plate *F* has the piercer and pilot-pin holes bored with the die block. It is made of ½-in. cold-rolled steel. Clearance around the shave punches is laid out from the die block. A starting hole is drilled in the center and the holes are machined to size in the slotter. A blank is riveted to the stripper to make up the difference in thickness between the nest plate and the part.

Punch plate *G* has the pilot pins driven in it, the holes having been bored with the die block. The bushing for the piercer is driven in, but the piercer floats in the bushing. Clearance holes are drilled for the stripper springs.

The piercer *H* is made of tool steel, hardened and ground, and the shaving punches likewise. The latter are a snug sliding fit in the die openings. As the punch sizes the stock it must be made to size and the clearance is sufficient for a sliding fit. A heel on the cutting end of the shaving punches enters the die block and backs up the punch before the cutting starts. These punches are mounted on the punch plate which is recessed to receive them. If the recesses were not employed, the travel of the stripper would be limited and therefore the amount the punches could be sharpened would be limited also.

The walls of the shave openings in the die block are made straight, whereas for the piercing bushing the top ⅛ in. is straight and the remainder has a ¼ deg. taper.

The entire periphery of a part is shaved in the compound-type shave die, illustrated in Fig. 41. The part was pierced and blanked in the die shown in Fig. 32 (*AM*—Vol. 80 page 587), under the subject of progressive dies. The two holes were pierced in an operation following the blanking which took place in Fig. 32.

Since the die block determines the size of the part, it is made first. After

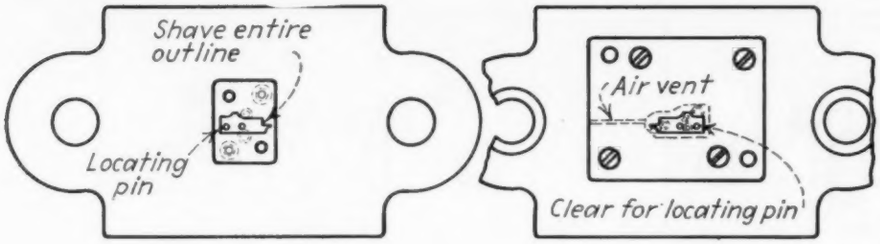


Fig. 41—When the limits on the part are close, a templet should be made and the blank and shave dies fitted to it

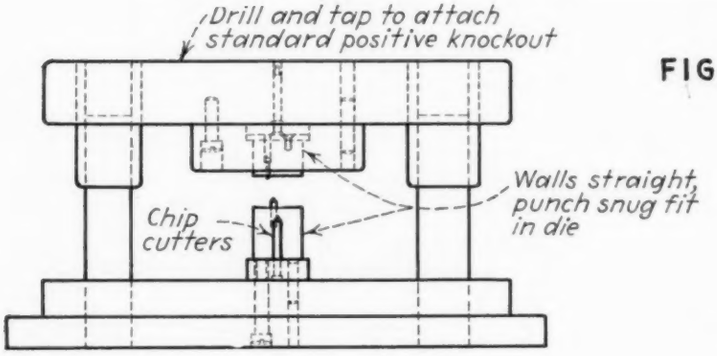


FIG. 41

Fig. 42—The front end of the moving nest plate B is machined to fit the part

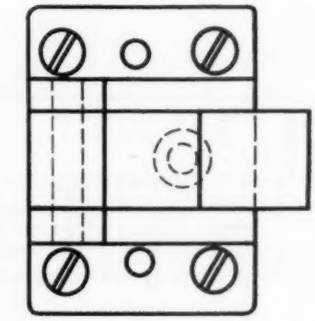
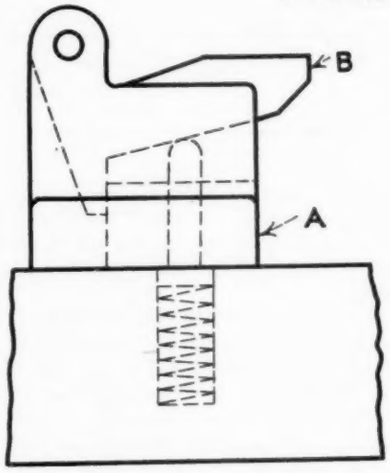


FIG. 42



being cut from a bar of oil-hardening tool steel, shaped to size, and ground on the top surface for layout purposes, the block is heated until it turns purple. The shave opening is laid out, the starting hole drilled, and then the rest of the metal inside the line is removed in the slotter. For shaving a part such as shown, the shave and blank dies should be fitted to a templet. The slotter operator should leave a little metal to be removed by the bench man, and if the limits on the part are close, the bench man should leave a little to be stoned out after hardening. The walls in the opening are straight without taper. The screw and dowel holes are put in and the die blocks hardened. After the shave opening has been stoned to size, the shedder can be made. The knock-out pins that operate the shedder are made of hardened drill rod.

Oil-hardening tool steel is employed for the shedder which is a snug sliding fit in the die block. Holes for attachment of the retaining plate are drilled and tapped, and the clearance for the locating pins drilled. Then the hole for the push-off pin is drilled and tapped and following this operation the shedder can be hardened. The push-off pin is shown in detail in Fig. 38. (*AM*—Vol. 80, page 628). The retaining plate is made of cold-rolled steel and case hardened. It is attached to the movable member with 8-32 flat head screws.

The punch, also made of oil-hardened tool steel, is machined, ground and laid out from the die block. It is rough machined nearly to the layout lines and sheared into the die block. It is finished to a snug sliding fit without clearance. The locating-pin holes are bored and the punch is hardened. It is then stoned and fitted to the die-block opening. The die block is then attached to the upper member, and the punch is inserted in it and screwed and doweled to the sub press.

When there are no holes for locating pins in a compound-type shave die, a moving nest plate must be employed. Fig. 42 is an example. All parts of the nest plate are made of tool steel, hardened and ground. The base *A* is attached to the lower member of the sub press, and furnishes the guide and pivot point for the nest. The pivot pin must be above the top of the part on the punch. Nest plate *B* pivots as shown, and the heel holds the locating end at the correct height. The spring and plunger hold the nest up, but as the die comes down, the die block strikes the nest and swings it out of the way.

Part X of *Die Design and Die Making* will appear in an early number.

Drilling Out Openings

STANLEY BALDWIN

Regardless of saber saws, cutting torches and nibblers, it is sometimes necessary to drill out openings in die-blocks or a similar job. The tedious process of drifting out the webs between the holes can be avoided by laying out the work so that counterboring alternate holes clear through the block will cut the core entirely free.

Speeding Up the Punch Press

HERBERT BOOTH

When a small or medium-sized punch press is used for one job exclusively, it can be speeded up considerably, providing the nature of the work will permit reducing the throw of the crankpin enough to make the change profitable.

Suppose the throw of the crankpin is changed to reduce the stroke of the ram from 2 in. to 1 in. The cutting speed is then reduced one-half, so the revolutions per minute of the crankshaft can be increased proportionately within the limits of safety.

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 16
K. H. CONDIT • F. H. COLVIN
EDITORS

GOVERNMENT CONTRACTS

THIS optimistic estimate of the benefits to come from the Walsh-Healey Act to regulate government contracts is to be found in the Department of Labor release on that piece of legislation:

> "It is also believed that more firms over a wider area will be able to compete for government business than was the case prior to the enactment of the new law. Under the statute which compelled the government to deal with the lowest bidder regardless of his labor practices, the manufacturer who maintained decent labor conditions was at a disadvantage. Under this act a premium is no longer placed upon the exploitation of labor."

No maker of quality goods or equipment will disagree with the principle expressed in the paragraph quoted. Neither will the procurement officers who have cudgeled their brains to find a way to get the quality material they wanted instead of being forced to buy on price. About the only sieve they could devise was a carefully drawn specification that often leaked, and occasionally collapsed on their own heads with dire consequences.

But will the Walsh-Healey Act accomplish this most desirable object? Or will it follow the path of other New Deal legislation from rose-bordered optimism, through administrative futility to Supreme Court frustration?

A little study of the terms of the law will show that it is of the familiar type requiring decisions from bureaucrats who have not had the experience necessary to the making of a wise decision. If industry objects to such decisions tedious court action is the alternative. In the first article in this number we give opinions from manufacturers which indicate clearly enough their suspicion of another "administrator's" law. They can hardly be blamed for their reluctance to subject themselves to Labor Department inquisition for the sake of a government contract, which may or may not be profitable.

Furthermore, with commercial business strongly on the upgrade, and many manufacturers of machinery already operating at capacity, the inclination to ignore government business will be stronger than when government orders bulked large in a meager order book.

COMPETENT critics say that the Walsh-Healey Act is far less injurious to business than either the Walsh Bill of the Senate or the original Healey Bill of the House. But why should we elect a Congress to pass bills that cannot possibly do what they are intended to do, and are accorded only the faint praise that they are less objectionable than some other measure? November may bring a conclusive answer. The Republican candidate is on record in his acceptance speech as being against such laws.

The Man Still Counts

NOT only the opponents of machinery but even those of us who know better frequently fail to appreciate the extent to which the man still counts in industry. Now that good ones are hard to get we are better able to see how much they do count.

On hand-operated machines it is not uncommon to find an occasional operator whose output exceeds all the others by a considerable margin. Training, skill and temperament all play a part. In most cases the really fast man does not seem to hurry at all, but his movements are so coordinated that they all count.

Less skill may be necessary as machines approach perfection. But care and loyalty to the job are just as necessary as in the poorly equipped shop. Management which fails to realize the important part played by the individual in any plant is hardly efficient.

Even assuming wages to be adequate and satisfactory there are other factors necessary to secure the maximum economy of output. Shop surroundings, harmonious relations between men, and between men and management, affect production for good or ill. Non-financial incentives such as recognition of skill, of loyalty and of the human factor all count.

Schools, apprentice or otherwise, should emphasize the importance of pride in the job itself, in the ability to make machines perform as they should. This pride in the job should be extended to the family of the worker. Unless his wife and children realize that he is a real factor in industry, his stock in the home circle is low. He is just the man who has to get his hands dirty to make a living. Managements which help the man's worth to be realized at home build loyalty that pays dividends.

Modern equipment is absolutely necessary for best results. But it must not be forgotten that—The man still counts!

Chips

WASHINGTON—Campaign warms up as Bruce and Ely, conservative Democrats, come out for Landon; Townsend, Coughlin and Smith (Huey Long's successor) assail Roosevelt and unite behind Lemke; Berry, Hillman and Lewis move for independent Labor Party to re-elect Roosevelt . . . Tugwell tells of plans to move farmers out of drought areas . . . Secretary Perkins holds meetings of parties interested in the Walsh-Healey Act and departs to make a speech in Paris and look over the International Labor Office in Geneva . . . Salaried and administrative WPA workers get vacations with pay by order of Aubrey Williams . . . In typical last-minute move to head off Landon, Roosevelt puts postmasters under civil service by executive order.

FOREIGN—Japanese army wants $880,000,000 over a six-year period, demands policy-forming body within cabinet, through it would control government . . . Great Britain plans production of gas masks for all citizens and instruction in their use . . . Mussolini boasts of Italy's victory over 52 "sanctionist" countries . . . Extensive building of submarines and destroyers by Italy and France force England to invoke "escalator" clause of naval treaty and retain many destroyers marked for scrapping in December, U. S. will follow suit . . . 200,000,000 marks of German loan taken by public, 500,000,000 by bank syndicate headed by Reichsbank, trade balance improves . . . Assassin fails in attempt on King Edward's life . . . Rumania will build strategic railway across Carpathians, with Czech funds, to connect Russian and Czech military forces . . . Leftist government in Spain tried three premiers in 24 hours as troops rebel and foreign legion returns from Morocco to join revolt, thousands killed . . . Britain rushing production of 300-mi. per hr. defense planes . . . Japan practices defense against "problem" attack by U. S. and Soviets.

FINANCE—Federal Reserve Board raises reserve requirements of member banks by 50 per cent, effective Aug. 15, to reduce possibility of dangerous credit inflation; "easy money" policy unchanged . . . General reaction to move is favorable.

INDUSTRY—Continental Can to spend $500,000 in enlarging its New Orleans plant and air-conditioning the offices . . . Result of first month of lowered passenger fares is increase in travel and revenue . . . New Deal pressure forces postponement of decision to suspend Lewis and his C. I. O. unions from the Federation, regular trial scheduled for Aug. 3 . . . Western railroad presidents' move to appoint their own coordinator as Eastman's job ends is followed by vote of Eastern presidents to continue his economy studies for themselves . . . Standard of N. J. orders $13,000,000 worth of tankers to replace obsolete ships, biggest private ship order ever placed in U. S. . . . Sherwin-Williams president announces vacation-with-pay plan for wage earners, hopes also to stabilize production and reduce seasonal variations.

INDICATORS—Steel production continues at above 70, highest since 1929 . . . Electric power output rises . . . *Business Week's* index climbs to high since 1931 at 76.9.

Business Outlook Good, Banker Says

Ayres Says 1936 Will Be Best Year Since 1930

Col. Leonard P. Ayres, in the Cleveland Trust Co. Bulletin, says business has clearly given "an exceptionally good account of its activities" in the first half of 1936. This promises to be the best business year since 1930, and possibly 1929, he declares.

Pointing out that industrial production advanced in the second quarter, and reached a level almost as high as that of last December, the article attributes a large part of the improvement to the increased output of metals, building materials and especially of automobiles.

In a study which is separate from the general view of business, the publication says that as recovery continues to develop "it becomes increasingly clear that among the things which the American public regards as necessities of life there must be included telephones and automobiles."

EDUCATORS ELECT

H. B. HAMMON, Brooklyn Polytechnic Institute, was elected president of the Society for the Promotion of Engineering Education at the annual convention of the organization at the University of Wisconsin, Madison. R. C. CRAWFORD, University of Idaho, and S. A. HARHARGER, Ohio State University, were named vice-president; F. L. BISHOP, Pittsburgh was elected secretary and W. O. WILEY, New York, was named treasurer.

June's Machine Tool Orders At New High

With a gain of about ten points since May, the index of orders for June, compiled by the National Machine Tool Builders' Association, reached 128.8. The 100 point on the index represents the average monthly shipments of machine tools in 1926.

Domestic orders increased about eleven points, and foreign shipments dropped a point, as compared with May. The two next highest months recorded during the past twelve months were August, 1935, and April, 1936, which stood at 125.8 and 125.7, respectively.

In June, 1935, the machine tool industry experienced the first strong push toward a higher level of activity that has characterized it during the past twelve months.

Work Is Begun On All-Metal Ships

Ten Diesel Powered, 80 Passenger Vessels Being Built by New Firm

Work on ten 80-passenger, 500 h.p. diesel motor cruisers, with a top speed of 45 m.p.h., has been started by the newly organized G. & G. Motor Boat Lines, Inc., at its shipyards in Toledo. Eugene K. Gross, president, designed the ships which will be used in a fast lake passenger and freight service between Detroit and Cleveland.

The craft will have aluminum alloy hulls, and cost about $20,000 each.

Table I—Index of Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1935—May	57.3	16.0	73.3	67.1	21
June	75.5	15.6	91.1	76.7	17
July	82.5	37.3	119.8	94.7	31
August	78.2	47.6	125.8	112.2	37
September	54.1	25.9	80.0	108.5	32
October	79.5	23.4	102.9	102.9	23
November	79.2	19.4	98.6	93.8	19
December	78.1	20.2	98.3	99.9	21
1936—January	95.7	15.1	110.8	102.6	14
February	99.8	12.3	112.1	107.1	11
March	89.0	16.3	105.3	109.4	15
April	110.9	14.8	125.7	114.4	12
May	95.7	23.2	118.9	116.6	19
June	106.5	22.3	128.8	124.4	17

Table II—Distribution of Orders

Average Indexes of Individual Companies	Companies in Per Cent of Total Number Reporting: 1935, by Quarters: 1st	2nd	3rd	4th	1936: 1st	2nd
200-up	40.2	5.8	14.2	11.3	13.0	17.2%
100-199	12.5	15.8	22.1	24.3	24.6	32.6
60-99	16.9	22.0	17.2	21.7	22.4	19.0
20-59	39.6	31.2	31.6	27.7	26.5	21.8
Less than 20%	26.8	25.2	14.9	15.0	13.5	9.7
		100.0	100.0		100.0	100.0

U. S. Bids Stimulate Airplane Output

Continued Gains Reported by Manufacturers

With a gain of 33 1/3 per cent in aircraft production during the first quarter, as compared with the same period last year, second quarter orders are running well ahead of those for the like period of 1935, aircraft manufacturers report.

Consolidated Aircraft Corp., San Diego, Calif., received last week an order from the U. S. Navy for 50 airplanes to cost $4,898,000.

Orders on hand reported by the Seversky Aircraft Corp., Farmingdale, L. I., total $2,686,250, most of which represents government contracts. Of the army order 114 single-place airplanes, to cost $1,660,512, have been begun, with deliveries in lots of 85 to begin within 90 days.

Lockheed Aircraft Corp., Burbank, Calif., reports a backlog of $630,000. During the first four months of the year this company delivered eight airplanes, costing about $400,000.

Bell Aircraft Corp., Buffalo, has 800 men working on wing panels, a contract amounting to about $800,000.

Taylor Aircraft Co., Bradford, Pa., has ordered 400 engines from Continental Motors Corp., Detroit, for its production of "Cub" airplanes, a small, low-priced craft.

Curtiss Airplane & Motor Co. was awarded a contract for 83 two-place scout bombers by the U. S. Navy, price not disclosed.

Northrop Aircraft Corp., Inglewood, Calif., received a U. S. Navy order for 54 dive bombing airplanes, and Chance Vought Corp., Hartford, Conn., will build 54 more of the same type.

Pratt & Whitney Co. will supply engines for most of the recent army and navy orders. The heavy army craft will be powered with the new 1,000 h.p. Twin Wasps, and the navy ships will use 750 h.p. Twin Wasp Juniors.

HEADS BOLT MAKERS

Bayonne, N. J., Manufacturer Elected President of Institute

ARTHUR P. MORRIS, president, Bayonne Bolt Corp., Bayonne, N. J., has been elected president of the American Institute of Bolt, Nut & Rivet Manufacturers, Cleveland.

GEORGE S. CASE, Lamson & Sessions Co., Cleveland was elected vice-president and JAMES D. EGGERS, Guardian Bldg., Cleveland, was named secretary-treasurer.

Buick Master Mechanic

FRED C. PYPER

FRED C. PYPER, assistant master mechanic, has been appointed general master mechanic to fill the vacancy caused by the death on July 4 of A. T. BRABYN, veteran Buick executive. His post as assistant master mechanic will be filled by ROGER E. MITCHELL, general tool supervisor.

Both joined the Buick organization in 1916. Mr. Pyper was foreman of tool grinding in the motor plant. He was promoted to tool supervisor of the motor plant, then became general tool supervisor for the entire Buick plant, and two years ago was appointed assistant master mechanic. Mr. Mitchell also joined Buick as tool designer. One year later he was placed in charge of the drafting room in the motor plant. In 1932 he was appointed process engineer of the motor plant and in 1934 was promoted to the post of general tool supervisor.

$5,000,000 Expansion Under Way at Toledo

Half of Sum Will Be Spent for New Manufacturing Equipment

Increasing business activity in the metal-working, glass oil refinery and other industries in Toledo, is seen in the announcements made by 12 Toledo firms in the first half of 1936 of expansion programs totaling more than $5,000,000.

Headed by the $1,500,000 development of the Standard Oil refinery and the $1,000,000 expansion of the Libbey Glass plant, the list also includes extensive additions by Pure Oil Co., Libbey-Owens-Ford Glass Co., Doehler Die Casting Co., Industrial Steel Castings Co., S. M. Jones Co., National Supply Co., Champion Spark Plug Co., City Auto Stamping Co. and Interlake Iron Co. Many smaller expansion projects announced by other Toledo firms are not included in this 5-million dollar total. Half of this five million dollar expenditure will be spent on new equipment.

Canton, Ohio, Reaches New Employment Peak

All records for industrial employment in Canton, Ohio, have been broken with 20,267 reported employed in factories there on July 7, the Canton Chamber of Commerce reported. This exceeds by 67 workers the former peak reported in April, 1929.

The new figure topped last year's mark for the same period by 25 per cent. The data were obtained from 68 plants, representing about 90 per cent of the city's industrial employment.

Welders Will Meet October 19 to 22

Cleveland Meeting To Hear Reports on Fundamental Research

Plans for the 17th annual meeting of the American Welding Society include presentation of more than 25 papers at the seven technical sessions to be held from Oct. 19 to 22 at Hotel Cleveland, Cleveland.

Two sessions will be held jointly with the American Society of Mechanical Engineers. An exposition of welding equipment and supplies will be held at the public Auditorium throughout the week of Oct. 19.

Baldwin Gets Order For Seven Locomotives

21 Engines for 1936 Delivery Reported by Philadelphia Company

Baldwin Locomotive Works, Philadelphia, has received an order from the Richmond, Fredericksburg & Potomac Railroad for five 4-8-4 high speed passenger engines, equipped with 12-wheeled tenders, to be used in handling passenger traffic from Washington south during the coming winter.

Baldwin also received an order from the Pittsburgh & West Virginia Railroad for two 2-6-6-4 single expansion articulated type locomotives for heavy service bringing the total to 21.

Assistant Buick M. M.

ROGER E. MITCHELL

Slide-Film Debunks Terrors of Technology

Sophistries of Technological Unemployment Hit by Manufacturers

An advance showing of the slide-film, "Man and Machines," sponsored by the National Association of Manufacturers, was held at the R. C. A. Building, New York City, on July 22. This film, the third of a series of five intended to combat some of the sophistries concerning modern industry, deals specifically with the question of technological unemployment. It is available for showing by industrial plants, civic associations, women's clubs and engineering or scientific societies.

The meeting was opened by Dr. O. H. Caldwell, a director of the new Museum of Science and Industry which is housed in the same building. Following the film those present had an opportunity to visit the museum.

Noel Sargent, secretary of N. A. M., gave a short address on "Our Machine-Made Future."

ALFRED H. SCHÜTTE DIES

German Machinery Manufacturer and Agent Was 81

ALFRED H. SCHUTTE, senior member of the firm bearing his name, of Köln-Deutz, Germany, died on June 28 in his 82nd year. Mr. Schütte was well known in machine tool circles for many years, both as a manufacturer of high grade machines and as a dealer in American machines. While a member of Schuchardt & Schütte he was one of the pioneers in the introduction of gear hobbing machines into this country, where he had many friends.

Watching Washington

Landon favors full freedom of labor . . . His stand attacked by union heads . . . Political repercussions in doubt . . . Lewis defies Green "court" . . . Strike danger diminishes

WASHINGTON—Are American workmen to be free from interference from "any source" or merely from the corporations or other employers who pay their wages? Governor Landon in his acceptance speech made clear his stand. He stated that his understanding of the Republican platform is that employees are to have "entire freedom from coercion or intimidation by the employer, any fellow-employee or any other person."

Salaried labor leaders do not agree that workmen should have this freedom and are pretty well united in condemning Candidate Landon's words. They have now come out openly for a policy of one-sided protection of the worker whereby he will be free from his employer but not from the hired labor agitator who would interrupt his income through the engineering of an unwanted strike and cut into his pay envelope through compulsory collection of union dues.

Labor Divides Vote

On the face of it, Governor Landon's stand might appear as an alienation of the organized labor vote. It is true that if organized labor followed its leadership it would no doubt solidly back Roosevelt. But labor in this country, traditionally independent, divides its votes between the parties regardless of what union officials may seek politically.

Conditions this year are different, and precedents are of little help. The question is not whether union leaders can deliver the vote at will—it is well known they cannot — but whether union workers who have no part in union labor politics, who are not seeking to obtain leadership for themselves in their organizations, will figure that it is to their personal interest to follow politically John L. Lewis and William Green.

Has Forced Unionizing

What makes the situation different this year is that this Administration has gone a long way toward forcing unionization of all industry. So any worker who believes that unionization should be fostered by government would naturally find himself inclined to vote for Roosevelt unless he were moved more strongly by other issues involved, such as fear of too much government spending, fear of too much taxation boosting the cost of living or fear of the political machine James A. Farley has created. The average union worker will make up his mind—or else cling to his original convictions—utterly regardless of anything Lewis and Green and their lieutenants may say. The few who will follow them will just about be offset by those who vote against Roosevelt for no other reason than that Lewis and Green want him to be elected. For there are plenty of loyal union labor men who think their leaders are bunglers who ought to be replaced and hence are glad to have their weakness demonstrated.

Another element to be considered is the workers in the steel, motor, rubber and other unorganized industries who very definitely—but also very privately—do not want the organization drive to succeed. There is no way of calculating their number, but there is such an element and probably it is fairly large.

Meanwhile the Lewis-Green split widens. Last week twelve unions affiliated with the Committee for Industrial Organization refused to appear before the executive council of the A.F. of L. on August 3 for trial on charges of fomenting "insurrection." Notification of the action was transmitted to Green by Lewis as C.I.O. chairman. This stand is in direct defiance to the A.F. of L. Since neither side seems ready to back down, an open schism in labor ranks appears inevitable. Edward F. McGrady, Assistant Secretary of Labor, has been acting as the Administration's conciliator but to date has made no progress.

Danger of serious labor trouble before election appears to have passed. Lewis has learned that the proportion of the employees in the steel industry who will follow him is too small to start a successful strike.

Labor and Vote Strategy

Some think the Administration would welcome enough labor disturbances to creat an impression in the public mind that such a situation will be chronic if the courts continue to have their way and Congress does not pass the Guffey bill and other labor measures. But it is known that at least some New Deal leaders feel that a more likely public reaction would be that the party has encouraged labor to be unreasonable in its demands and the result is strife and confusion. If this view prevails the influence of the Administration would be exerted to defer any major clash.

High Spots in Governor Landon's Address of Acceptance

Practical progressives have suffered the disheartening experience of seeing many liberal objectives discredited during the past three years by careless thinking, unworkable laws and incompetent adminstration.

The record shows that in 1936 the primary need still is jobs for the unemployed. The time has come to stop this fumbling with recovery.

We are far behind in expenditures for upkeep and improvements and for expansion.

We would consider it base beyond words to make loyalty or service to party a condition upon which the needy unemployed might obtain help.

. . . we shall amend the Social Security Act to make it workable.

Mounting debts and increasing taxes constitute a threat . . . we and our children, as taxpayers, have to pay the bill.

. . . the Administration has taken the farmer out of foreign markets and put the foreign farmer into the American market.

. . . an employee has an equal right to join a union or to refuse to join a union.

. . . rushing it to the doorstep of the President is a bad way to handle a labor situation or any other situation.

. . . a new and dangerous impulse . . . to take away and lodge in the Chief Executive, without the people's consent, the powers which they have kept in their state governments or which they have reserved in themselves.

When Federal regulation failed, the industry made progress in the solution of the problem.

Neither political nor civil liberty long survives the loss of economic liberty.

. . . I propose to restore our government to an efficient as well as a constitutional basis.

Plan Filed to Save Willys-Overland Co.

Ward M. Canaday, Advertising Man, Is To Be Chairman

Reorganization plans for the Willys-Overland Co. were filed July 25 at Toledo in Judge George P. Hahn's Federal court. It provides for a $6,350,000 company with working capital of $3,500,000.

Ward M. Canaday, president of the United States Advertising Corp., is to become chairman of the board, and David R. Wilson, Pontiac, Mich., president.

Willys-Overland Motors, Inc., the successor company, will occupy 70 per cent of the present plant, which covers 119 acres. Thirty per cent of the 7,000,000 square feet of floor space will be rented or sold.

The plan calls for production of 70,000 cars in 1937. The production capacity of the plant will be 180,000 cars annually.

Willys-Overland, once the second largest automobile company in the United States, with 23,000 men on its payroll, now has 3,000 employees.

Industrial Concerns Borrow to Modernize

Since F.H.A. Raised Loan Limit a Year Ago, Half Bought Machines

A total of $14,880,183, or nearly a half of the $30,000,000 borrowed in the higher brackets of the Federal Housing Administration's loan program for modernization during the past 12 months has gone into machinery and equipment.

A year ago the limit on loans for modernization was raised from $2,000 to $50,000, making the funds available for concerns to rehabilitate and modernize their plants. Manufacturers and industrialists have used about a third of the total, of which nearly $7,000,000 has gone to buy machinery and manufacturing equipment.

The F.H.A. itself loans no money, but insures banks against losses up to 10 per cent of their total loans on the administration's terms.

Railroads Protest Plan For Power Reverse Gears

Safety to employees and the public would not be increased by compelling the railroads to install power reverse gears on virtually all locomotives, a brief field by the Association of American Railroads asking the Interstate Commerce Commission to dismiss proceedings brought by railroad unions.

The brief points out that the only result would be to place a heavier financial burden on the carriers at a time when they can least afford it. The Brotherhood of Locomotive Engineers and the Brotherhood of Locomotive Firemen and Enginemen, asks for the installation of power reverse gears as a substitute for hand-operated gears.

The order would require installing power reverse gears on more than 18,000 locomotives at a cost of more than $7,000,000.

In 1933 the Union instituted proceedings to have power reverse gears installed on all steam locomotives on the ground that the manually operated gears constituted an unnecessary peril to life and limb.

CONNECTICUT ENGINEERS HOLD FIRST CONFERENCE

The first of a projected series of conferences of Connecticut engineers was held July 25 at Bridgeport. Dudley B. Bullard, vice-president, the Bullard Co. of that city, was chairman of the afternoon session, and Harry E. Harris was chairman of the event, heading the joint engineering committee, comprising the Bridgeport section of the American Society of Mechanical Engineers, the Connecticut Society of Professional Engineers and the Bridgeport Engineers Club. Igor I. Sikorsky, airplane manufacturer, spoke of early trans-Atlantic heavier-than-air passenger and freight schedules.

ABRASIVE GRAIN SIZES APPROVED BY INDUSTRY

The current revision of simplified practice recommendation R118, Abrasive Grain Sizes, has been accepted by the industry, and will become effective September 1, the division of simplified practice, National Bureau of Standards, announced.

LEASES MERIDEN PLANT

Sub-Division of Aeolian Factory for Small Manufacturers Is Plan

Aeolian Piano Co.'s factory buildings at Meriden, Conn., abandoned five years ago when the concern moved to New Jersey, have been sold to Benjamin Slade of New Haven. The fourteen buildings will be sub-divided and leased to manufacturing companies.

Aged "Camelback" Rolls 45 m.p.h. In Last Fling

Lackawanna Shops Executives Play Host to New York Railroad Historians

A 35-year-old "Mother Hubbard camelback" engine, the last word in locomotives at the turn of the century, hauled 165 members of the New York chapter Railway and Locomotive Historical Society from Hoboken, N. J., to Scranton, Pa., to inspect the shops of the Delaware, Lackawanna & Western Railroad, July 19. The train averaged 45 m.p.h. for the 135-mile run.

The trip commemorated the 100th anniversary of running the first train over the Morris & Essex Railroad, now a part of the Lackawanna system. A new, three cylinder heavy freight service engine was inspected en route at the Hampton, Pa., enginehouse.

The "camelbacks," with a cab on each side about midway from the front to rear of the boiler, are being retired from service by the line.

The society is composed of insurance men, physicians, lawyers and business men, with less than ten per cent of its membership connected with railroad companies. The tour was headed by Thomas T. Taber, chapter chairman. C. J. Scudder, superintendent of motive power of the Lackawanna, headed the reception committee which guided the members through the shops.

WAS PRODUCTION EXPERT

Baron Wargrave Served as British Munitions Adviser

Sir Edward Alfred Goulding, Baron Wargrave, chairman of Rolls-Royce, Ltd., and an adviser to the British Government on manufacture of armaments, died July 17. Considered to be one of the most eminent production authorities in the United Kingdom, the baron, prior to his elevation to the peerage, had wide experience as a consultant to manufacturers.

HACK SAW STANDARD REVISED

National Bureau of Standards Issued Proposed Revision on R90-29

Standing committee in charge of simplified practice recommendation R90-29, on hack-saw blades, has approved a revision of the recommendation, the National Bureau of Standards announced. The proposed revision covers tungsten alloy steel blades, double hardened blades, high speed steel blades and special alloy blades in hand and power sizes.

Business Upturn Is Predicted for 1936

U. S. Chamber of Commerce Cites First Half Gains

Unless influences outside the normal operations of business processes intervene, "the course of 1936 may show this as the best year in physical volume of business since 1929," a summary of national business affairs issued July 25 by the Chamber of Commerce of the United States, says.

Among the indices which have been showing a consistent upward trend are employment in manufacturing establishments, production of goods, construction, retail trade, car loadings and passenger traffic, foreign trade, electric consumption and loans for capital purposes.

"The course of events carried employment in manufacturing establishments in June, 1936, to a point higher than at any time since October, 1930," it was said.

"If the second half of the present year has usual relations to the first half, employment in manufacturing will be back to the level of Spring, 1930.

"Foreign trade also has been growing and making its additions to the volume of business transacted within the country. In the first six months of the year the value of domestic merchandise exported, at $1,134,000,000, was 13 per cent more than for the first half of 1935 and 72 per cent over the value in the first half of 1933.

"The value of exports in the month of June, 1936, at $180,000,000, was 8 per cent over the value for June, 1935.

I.H.C. EXTRA PAY PLAN

Pro Rata Reward Is Announced by Harvester Company

The International Harvester Co., Chicago, announced extra compensation will be paid to all employees in the United States and Canada who have worked for the company one year or more by Oct. 31.

All employees, who, on that date, have worked one year but less than two years will receive an extra week's pay. Employees having worked for two years or more will receive two weeks' pay. Spokesmen for the company said an extra compensation plan had not been in operation for several years.

It also was announced that "the pension plan which has been maintained at the company's own expense since 1908 will undergo modifications made necessary by the Social Security Act.

Nash Motors Now Twenty Years Old

Nash Motors Co., Kenosha, Wis., will be twenty years old on July 29.

Since beginning operations the company has built and sold over 1,100,000 automobiles and its aggregate sales have amounted to more than $1,067,000,000.

The company has paid $110,185,280 in dividends to its stockholders and $53,943,544 in taxes to various assessing bodies. Despite the five years of business depression since 1930, the company entered 1936 with cash and government securities amounting to $24,674,562. It has no funded indebtedness.

"Flying Boxcars" Would Stimulate Aero Output

Tests of Air Freighters Under Way; New Outlet in Prospect

"Flying boxcars" will start a national all-freight air express in September under plans which the Transcontinental & Western Air, Inc., Chicago, is reported to be developing.

Aviation engineers have for some time predicted that air express might be the first commercial cargo to move in the stratosphere.

Tests still being conducted by the air line have demonstrated that large tri-motored planes, with all seats stripped out and special doors replacing passenger entrances, can function economically as air-freight carriers with a load of 3,500 lb.

If successful, the service would stimulate heavy airplane manufacture.

Industrial Review

• PROBABLY one of the most promising signs for business is its present power to disregard political repercussions and to tend to its knitting without dropping a stitch. With the fiercest political battle in twenty years just ahead and despite uncertain prospects as to labor disputes and government interference, industrial management today is guided strictly by business needs. As it affects machinery sales, this eyes-on-road policy means maintenance of the satisfactory level established in June. Only in a few quarters has summer spottiness become apparent.

• NEW ENGLAND finds orders undiminished, and New York is enjoying July volume at least equal to that of June, the best month since 1929. Some part of these sales may be attributed to anticipation of price increases, but usually the most potent factor is the pressure of manufacturing requirements. Industrial plants are busy, need new machinery and now have confidence enough to order ahead even for 1937 delivery. Both orders and inquiries are favorable in Philadelphia with belated railroad buying in evidence on a small scale. In a few instances new commitments are being held in abeyance until fall.

• PITTSBURGH notes a slight seasonal slackening but is surprised and pleased at the level maintained. Westinghouse has put out a list of requirements for its new Lima plant for the manufacture of small motors. Inquiry ahead is active, and the labor situation looks better. Machine tool plants in Cincinnati are well filled with orders with more pending. The Remington-Rand plant is still closed but otherwise labor relations have improved. Volume of orders here exceeds May or June. During the past few weeks many Cleveland metal-working plants have hit a new high level. The only problem with labor is the continued shortage of skilled hands. Minor delays in materials and supplies have been experienced in a few instances because of the heat and increased demands on suppliers. Prospects are good for a satisfactory second half.

• DETROIT finds July quiet with little prospect for improvement in August. This applies to machine tool, small tool and the supply business. After a big June, Chicago, too, notices a slackening and does not look for big volume until the fall. July in Milwaukee has been about twenty per cent below the year's average. No labor trouble is apparent, but outside organizers are active. A seasonal dropping off is felt in Indianapolis, but from the volume of inquiries coming in this seems only temporary. Orders keep up well in St. Louis with small tools and supplies moving at an even pace. Machine tool inquiry is active.

World Engineers To See U. S. Industrial Plants

Nine Technical Tours Will Be Feature of Third World Power Congress

Plans for a series of technical study tours, which will take 600 of the world's leading engineers to the scenes of this country's greatest industrial accomplishments, have been completed as a supplement to the Third World Power Conference, Washington, September 7 to 12.

Nine separate technical study tours will conduct the visiting foreign engineers, scientists, and industrialists, in company with a group of Americans, on visits to some two dozen important centers, where will be seen this country's most recent developments in the production and application of electric power.

The tours will be held both before and after the Conference sessions in Washington, where more than 700 distinguished foreigners, representatives of 48 nations, will meet with some 2,500 Americans for a week's sessions the conference committee reports.

A.S.M.E. WINS

Judge Finds Society Kept Activities Within Specified Limits

The court has confirmed the report of the referee in the case of John Parker, Philadelphia, vs. the American Society of Mechanical Engineers, New York, and the order, which finds that the Society did not misappropriate or divert funds to any other purpose than that for which the Society was incorporated, nor has it engaged in other business than specified in its incorporation certificate, was entered.

Costs, amounting to $1,500, were awarded to the A.S.M.E. against Mr. Parker in the order handed down by the court.

GEAR MAKERS TO CRUISE

Three-Day Trip on Lake Steamer from Chicago to Cleveland Is Plan

The nineteenth semi-annual convention of the American Gear Manufacturers Association will be held aboard the Great Lakes steamer "Seeandbee," sailing for a three-day cruise from Chicago on Sept. 8. The steamer will stop Sept. 9 at Mackinac Island, and will continue its cruise through Georgian Bay, St. Clair River and will finish its trip at Cleveland Sept. 10. Automobiles may be checked aboard the ship for a nominal fee.

Carboloy Sales Manager

K. R. BEARDSLEE

DR. ZAY JEFFRIES, former president, has been elected chairman of the board of directors of Carboloy Company, Inc., 2985 East Jefferson Ave., Detroit, succeeding P. R. Mallory, resigned. W. G. ROBBINS, formerly vice-president and general sales manager, becomes president. A. MACKENZIE has been elected vice-president in charge of manufacturing, and K. R. BEARDSLEE, formerly Pittsburgh district manager, has been appointed general sales manager of the company. J. R. LONGWELL, die engineer, has been named chief engineer.

PERSONALS

At the annual meeting the Automobile Manufacturers Association in Detroit last week, ALVAN MACAULEY, president of the Packard Motor Car Co., was reelected president of the association. At the same time all other officers and directors were reelected.

ALFRED REEVES is vice-president and general manager of the A.M.A., of which all automobile companies except Ford Motor Co. are members.

THOMAS BRADLEY, in charge of manufacturing and purchasing of the Hupp Motor Car Co., Detroit, has been elected executive vice-president of the company.

SIGURD BRATINGSON has been appointed factory manager of Francis Keil & Son, Inc., New York, manufacturer of tools and builders' hardware.

A. J. LEWIS has been named Detroit district manager of the American Emery Wheel, Providence, R. I.

C. R. DAVISON has been appointed mechanical engineer of the Standard Stoker Co., Inc. E. S. SEIBEL is now chief draftsman.

GEORGE E. HAMMANN has been elected president of the Progressive Manufacturing Co., Torrington, Conn., to succeed the late GEORGE B. ALVORD. FRANK H. LYON has been elected secretary and succeeds Mr. Alvord on the board of directors.

GEORGE D. HARTLEY, who withdrew from the firm of Sleeper & Hartley last year, has disposed of his stockholdings and is no longer interested in it in any way. His plans for the future are indefinite.

P. PETRI, for the past ten years engineer of maintenance, Baltimore & Ohio Railroad, Eastern Lines, has been promoted to chief engineer of maintenance. C. B. HARVESON succeeds Mr. Petri.

P. K. REED, formerly president of Atlas Conveyor Co., has joined the C. O. Bartlett & Snow Co., Cleveland, materials handling equipment manufacturer.

CHARLES A. ROWAN, president, Westinghouse Air Brake Co., Wilmerding, Pa., has been elected chairman of the board of both that company and Union Switch & Signal Co., Swissvale, Pa., succeeding A. L. HUMPHRIES, who resigned to become chairman of the executive committee of both companies. GEORGE A. BLACKMORE, vice-president of the Westinghouse company, becomes president of both concerns.

DONALD SAMMIS, formerly Stratford (Conn.) town manager, has been appointed works manager of the Underwood - Elliott - Fisher plant, Bridgeport. Mr. Sammis had been with the company for two years as assistant works manager.

E. M. SCHULTHEIS, formerly with the Detroit office of Timken Roller Bearing Co., has joined Clark Equipment Co., Buchanan, Mich. He has had wide manufacturing experience in the automotive industry.

EDWIN J. SCHWANHAUSSER, manager of the Buffalo Works of Worthington Pump & Machinery Corp., has been elected president of the Buffalo Chamber of Commerce.

ROBERT C. STUART has been elected president of Barlow & Seelig Mfg. Corp., Ripon, Wis., washing and ironing machine manufacturer, succeeding the late MARSHALL R. SCOTT.

CLARENCE E. WRIGHT, for the past three years associated with the Republic Steel Corp., and previously on the editorial staff of the *Iron Age*, has been appointed managing editor of the magazine.

Motors AND OTHER MATTERS

Caution is now discord in Detroit's optimistic chorus . . . "Economy cars" may start trend . . . Copper alloy cylinder head introduced . . . Continued demand keeps 1936 output humming, will delay several 1937 plans

BURNHAM FINNEY
Western Editor

DETROIT—For the first time in four years Detroit isn't agreed on what lies ahead for the automobile industry. Ever since 1932 the outlook has evoked effusive expressions of optimism from the "brass hats" and in every case their predictions have been more than realized. Today, however, caution is being preached by some groups which aren't sure that the industry isn't due for a breathing spell after the upward surge from a low of 1,431,494 units in 1932 to over 4,600,000 units this year.

The pessimists are spreading the word, in print as well as by word of mouth, that 1937 will be a year of "pause and readjustment" with the production total not topping 3,800,000 cars and trucks. Basis for this chilling estimate is that purchasing power may be less next year than it is now, that car-price increases are imminent which will restrict markets, that dealers will require a period of retrenchment, and that automobile companies themselves will welcome a little less stress and strain for twelve months, provided that retail prices can be jacked up. Says one of the converts to the idea that 1937 will bring a breathing spell, "it would provide an opportunity to remodel plants and replace standard lines of machine tools that were purchased during the boom days of the 1920's."

Unquestionably the cream has been skimmed off the new car market. The most urgent replacements have been made. No one knows better than car manufacturers that 1937 will be a tough competitive year during which all their selling tricks will have to be used. Yet the gloom-spreaders are underestimating the resourcefulness of the industry if they believe that it intends to halt its upward march next year.

It is significant that one of the largest corporations is anticipating a volume for the industry equal to that in 1936 or possibly 10 per cent better. Its views are shared by others.

What may upset the sad calculations of the pessimists is the market next year for so-called economy cars. The industry feels that car owners are becoming more "economy-conscious" and that chances of increasing the number of two-car families are greatly improved when an automobile economical to operate is available as a second car. Companies are apt to pipe down in 1937 on such features as greater horsepower and more pick-up which eat up gasoline rapidly. An appeal will be made to the prospect's Scotch instinct. One prominent company is reported planning to market two lines of cars, using the same body styling for both patterned after the Lincoln-Zephyr. The higher-price car will have de luxe appointments, but the lower-price car is scheduled to have a bantam-sized motor, shorter wheelbase and lighter weight. It should sell around $440 or perhaps lower.

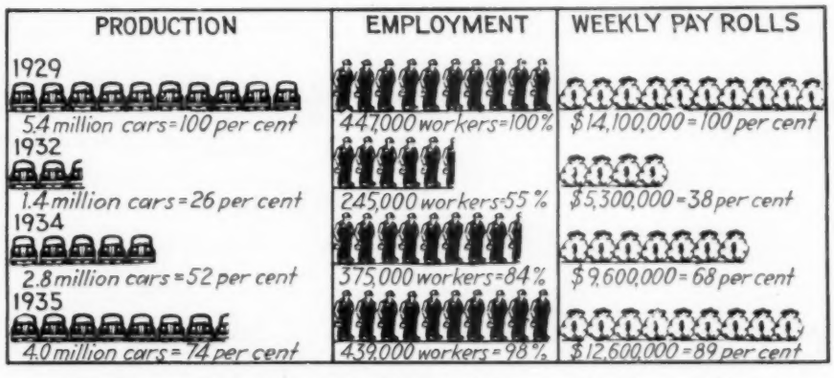
Again Heads Auto Makers

ALVAN MACAULEY

With Chevrolet breaking all-time sales records, its Standard models continue to account for over 45 per cent of the total.

As a resale item of special interest to truck and bus operators, a well-known company is making for V-eight Fords a copper-alloy cylinder head which, after heat treatment, possesses high heat conductivity and strength.

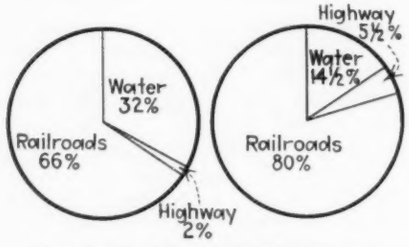
Not unmindful of the growing emphasis on economy, two companies this fall will attempt comebacks. The American Bantam Car Co., successor to the American Austin Co., will offer a small car to sell around $300 and designed to attain a speed of 60 miles an hour. It will be good for 40 to 50 miles on a gallon of gasoline, according to advance notices. A line of quarter-ton trucks as well as passenger cars will be introduced. Harry Miller, designer of racing engines, is vice-presi-



Employment Nears 1929 Level—**Although 1935 car production was 74 per cent of 1929, employment in the industry in 1935 reached 98 per cent of the all-time high established six years before, data of the Labor Information Bureau, Washington, show. Chart from 1936 edition, "Facts and Figures," just published by the Automobile Manufacturers Association**

dent in charge of engineering. Willys-Overland Co. has asked the federal court at Toledo for permission to spend $400,000 for new machinery and equipment for a new model to be shown at the New York Show. The present Willys car will be enlarged and redesigned to improve its appearance. Prices will be kept close to the current range of $395 to $445.

The insatiable appetite shown by motorists for new cars, even in torrid weather, has upset plans of some automobile companies to end 1936 production runs around August 1. Ford has made additional commitments for parts and materials which will carry assemblies of current models up close to October 1. Chevrolet and Buick also intend to build their present series in August and September. Pontiac will finish its run near the end of August. So will Oldsmobile. One of the Chrysler divisions, on the other hand, is about ready to call it a day on 1936 models. There won't be much effort made, however, to beat the gun on 1937 announcements.



Carrying Freight—Railroads still carry most of the freight in this country, particularly long-haul traffic, as measured by ton-miles, upper left. Trucks do better on short runs, as measured by total tonnage, than on long hauls

Chrysler to Start Early

Chrysler will be among the first to get started on new models. It has ordered for August delivery the first steel for its new heavy stamping department at the McGraw Avenue plant in Detroit. Hood assemblies and oil pans are among the parts to be stamped there. When the addition to the Marysville plant is completed, it is understood Chrysler will move its export department there. The service department already is established there. For the first time, Chrysler this year will pass the million mark in total annual assemblies of new cars. And it is whispered somewhat dolefully in Chrysler circles that sales this year would have been 25 to 30 per cent greater if the corporation had had capacity to build more cars and had operated full during the first quarter. Unlike General Motors, which is publicizing its expansion, Chrysler is maintaining a mouse-like attitude and saying nothing about its expenditures of ten million dollars in preparation for 1937.

Buick has bought all the machinery for its new transmission plant and hopes to be able to start production of automatic transmission units in September. Bendix has just perfected its "Turbo" flywheel gear. Using it, one automatically shifts into any gear except reverse. Shifting into neutral is not necessary. The gear is not yet in production.

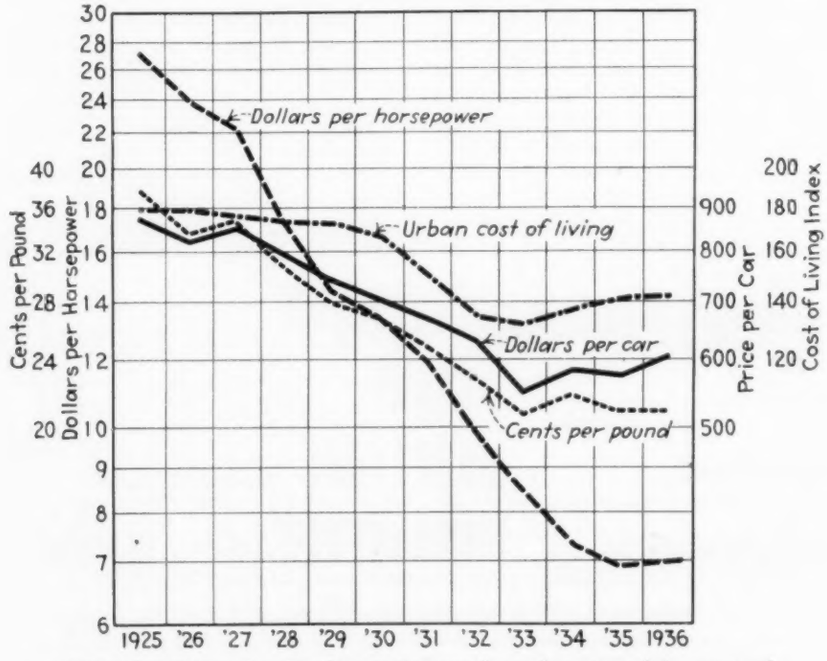
General Motors will have all-steel bodies on its lower-price cars next year, but will retain steel-and-wood construction in its higher-price lines. Eventually steel probably will be employed exclusively, but not in 1937. Steel tops will be adopted by more companies next year. Packard will be a convert, probably stamping the top in two parts and welding them together.

While Ford is committed for next year to cadmium-silver bearings, Pontiac already has quietly deserted them in favor of copper-lead bearings made by the AC Spark Plug Co. Graham-Paige has sold for about $200,000 a line of machinery used in production of its discontinued six to the Japanese makers of the Datsun small car. A car similar to the Graham six will be built in Japan.

Parts in Production

The 1937 parts are being made in small volume. Hudson is known to be stamping fenders for new models and Briggs is reported making some sheet metal parts for new Chrysler cars. Machinery is being shipped daily into the Packard plant where manufacture of the new six will begin late in August. District tool and die shops are loaded with work, operating extra shifts. New steel sizes are fully known and steel mills report releases surprisingly good.

Chief worry of machine tool people continues to be the delivery of equipment on time. Car makers, in some cases, have brought pressure on equipment builders to take last-minute orders and have the machines installed and ready to operate within 60 days.


Dollars per horsepower
Urban cost of living
Dollars per car
Cents per pound
Cents per Pound
Dollars per Horsepower
Price per Car
Cost of Living Index
1925 '26 '27 '28 '29 '30 '31 '32 '33 '34 '35 1936

Down Car Prices Go—Continuous downward trend, measured in terms of weighted averages per car, price per lb., or per h.p., is shown in this chart from the Automobile Manufacturers Association 1935 "Facts and Figures"

Merger Will Stimulate Screw Products Output

Defiance, Ohio, Companies to Unite Under Control of L. F. Serrick

Expansion of manufacture of both soft and heat treated screw machine products for the automotive industry is expected at Defiance, Ohio, as the result of merger of L. F. Serrick, Inc., and Defiance Screw Machine Products Co. The companies are capitalized at $100,000 and $300,000 respectively.

Controlling interest in the new company will be held by L. F. Serrick, who purchased a majority of stock in Defiance Screw Machine from Sidney Thompson, president.

BUSINESS ITEMS

Norma - Hoffmann Bearings Corp., Stamford, Conn., is celebrating the 25th anniversary of its founding, by Walter M. Nones, president.

Hodell Chain Co., Cooper Ave. and East 40th St., Cleveland, is the new name of Chain Products Co., established in 1886.

Carboloy Co., Inc., Detroit, has appointed A. H. Godfrey, former Cleveland representative, Cleveland district manager. P. W. Weiser, has been named Pittsburgh district manager.

General Refractories Co., Philadelphia, has moved its general office to the Real Estate Trust Bldg., Broad and Chestnut Sts.

Stephens-Adamson Mfg. Co., Aurora, Ill., conveyor and materials handling equipment manufacturers, has appointed F. E. Dunlap its Detroit branch manager.

Hopf, Kent, Willard & Co., a management engineering partnership, has been formed by merging H. A. Hopf & Co., New York, and Bigelow, Kent, Willard & Co., Boston. Offices will be at 500 Fifth Ave., New York, and at 10 Post Office Square, Boston.

OBITUARIES

CHRISTIAN PAULSEN BERG, an early associate of the late Frederick W. Taylor and Carl Barth, management engineers, and since 1932 an official in the manufacturing department of Link-Belt Co., Chicago, died July 4.

FRANCIS L. BISSELL, 64, assistant superintendent and for 37 years an employee of Bevins Brothers Mfg. Co., East Hampton, Conn., died July 8.

GEORGE F. BREITENSTEIN, 59, president of George F. Breitenstein Machine Co., Louisville, Ky., died July 8. He founded the business 28 years ago.

MARY EGELER CARUS, 76, president, Matthessen & Hegeler Zinc Co. and the Bronze Metal Products Co., La Salle, Ill., died recently. She was a graduate of the engineering school of the University of Wisconsin, and was known as a leading executive of the industry.

JOSEPH CLIFTON CONN, 67, machinery inventor and a director of Clipper Belt Lacer Co., Grand Rapids, who invented a number of aircraft and other mechanical devices, died July 4 in Boonton, N. J. He had been factory superintendent of the Remington Bicycle factory at Ilion, N. Y.

JOSEPH DOLAR, vice-president and formerly works manager, Templeton, Kenly Co., Chicago, died recently.

JOHN FARRELL, secretary-treasurer, Sheet Metal Mfg. Co., Youngstown, Ohio, and postmaster of that city, died July 9.

EDWIN ELMER FREDERICK, 69, member of the firm of Frederick & Elder, brass specialties manufacturer, died July 13.

L. HEELEY LINK, 49, vice-president, Bass Foundry & Machinery Co., Fort Wayne, Ind., died July 12. He was with the company for 33 years.

CHARLES LUNDBERG, 61, for 25 years a member of the editorial and business staffs of *Iron Age*, New York, died July 4 at his home in Upper Darby, Philadelphia suburb. He went to Philadelphia in 1919 as advertising executive of the publication.

H. C. PHILLIPS, 78, president of H. O. Phillips Co., Pawtucket, R. I., wire and metal specialties manufacturer, died July 13.

HENRY H. SANFORD, 79, retired president of the old New Method Stove Co., Mansfield, Ohio, died July 7 at his home in that city, following a long illness.

WALTER STEEGE, 50, owner of W. L. Steege Machinery Co., Chicago, died July 9. The company manufactures universal motor drives and other manufacturing equipment.

JOSEPH WALLACE, 67, consulting engineer, Black-Clawson Co., paper mill machinery manufacturer, died July 7 at Hamilton, Ohio.

WALTER E. WALLACE, 44, until recently vice-president of Metal Auto Parts Co., Indianapolis, died July 5. He was one of the founders of the company.

HARRY YEO, 55, president, Indiana Metal Products Co., Muncie, died July 5.

MEETINGS

DAIRY & ICE CREAM MACHINERY MANUFACTURERS ASSOCIATION. Oct. 12-17, Atlantic City, N. J. Roberts Everett, vice-president, 232 Madison Ave., New York.

GREAT LAKES EXPOSITION, July, August and September. Cleveland,, Lincoln G. Dickey, manager, Terminal Tower, Cleveland.

INDUSTRIAL RELATIONS, Nineteenth Annual Conference. Aug. 19-22. Silver Bay, N. Y. E. C. Worman, executive secretary, 347 Madison Ave., New York.

NATIONAL METAL SHOW. 18th Annual Exposition. Oct. 19-23, Lakeside Exposition Hall, Cleveland. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

NATIONAL SAFETY COUNCIL, INC. 25th Congress and Exposition, Oct. 5-9, Atlantic City, N. J.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC., Aircraft Production Meeting, Oct. 15, 16 and 17, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 West 39th St., New York.

EXPORT OPPORTUNITIES

Airplane instruments of all kinds. (Agency.) Rotterdam, Netherlands. *1175.

Rectifying equipment dry plate. (Purchase.) Birmingham, England. *1171.

Cranes. (Purchase.) Montreal, Canada. *1160.

Tools, building. (Agency.) Worthing, England. *1183.

Machinery to manufacture leggings. Havre, France. *1180.

Machinery for washing, sorting and grading oranges and tomatoes; fruit juice manufacturing equipment. (Purchase.) Paris, France. *1156.

Tool grinders, small and medium size, for garages and machine shops. (Purchase.) Edmonton, Canada. *1179.

Tools and small hardware. (Purchase.) Zurich, Switzerland. *1130.

Machine tools and automobile and accessory manufacturing equipment, manufacturing machinery for metal novelties. (Agency.) London, England. *1126.

Machinery, second-hand. (Purchase.) Montreal, Canada. *1125.

Gravel and road-building machinery, power driven. (Purchase.) The Hague, Netherlands. *1131.

Machinery for manufacturing soy bean oil, and general factory equipment. (Purchase.) Valletta, Malta. *1144.

Dynamometers, humidity meters (soil) and plastometers. (Purchase.) The Hague, Netherlands. *1131.

Water level, water current meters. (Purchase.) The Hague, Netherlands. *1146.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

Machine Requirements and Industrial Construction

EQUIPMENT WANTED

La., Shreveport—American Pipe & Supply Co., 2405 Texas Ave.—motor driven pipe machine, 2 to 12½ in. capacity.

Mass., Springfield—Col. T. J. Smith, Commanding Officer, Springfield Armory, will receive bids until Aug. 7 for 10 automatic milling machines ***Aug. 10 for machine for resetting band saw teeth, also hand setter and retoothing machine for hand saws.

Minn., St. Paul—U. S. Engineer, 615 Commerce Bldg.—locomotive cranes for dams in Mississippi River as follows: Dam No. 3, Red Wing, Minn., Dam No. 7, Dresbach, Minn., Dam No. 8, Genoa, Wis.; Dam No. 9, Lynxville, Wis.

N. Y., DeRuyter—DeRuyter Textile Co.—38 in. paper cutter, power operated, with automatic clamp.

N. Y., Dunkirk—Leeworthy Motor Co., Rupert Adams, Gen. Mgr.—complete machinery and equipment for branch sales and service shop in Silver Creek, N. Y., to include electric drills, air compressor, hand tools, lathe and other equipment.

N. Y., Syracuse — A. Wolfram, Hills Bldg. — electric welding machine.

O., Cleveland—City, C. B. Patterson, Purch. Agt.—3 lathes (complete) and 1 milling machine.

O., Toledo—Willys Overland Co., Wolcott Blvd. —machinery, tools and dies for proposed new factory.

Pa., Conemaugh — Franklin Borough School Dist., H. C. Tilley, Supervising Principal—one driver drill press; one combination belt and disc sander.

Pa., Easton—Modesco Tackle Block Co., Palmer Township—welding machines, transmission and conveying equipment and other machinery to replace equipment recently destroyed by fire.

Pa., Northumberland — Hannon Garage, M. Hannon—lathe, air compressor, hoist and small tools and equipment.

Pa., Oil City—Homer H. James—heavy duty air compressors, gas engines and equipment for pressure plants.

Pa., Philadelphia—Larry Congo, 1336 South Broad St.—cut-awl.

Pa., Wilkes-Barre—International Color Printing Co., 115 George Ave.—J. Gorman, Gen. Mgr. —color printing press and other printing machinery and equipment.

Pa., Williamsport—R. & G. Knitting Mills, W. R. Sattler, Supt.—power sewing machines and other equipment.

Pa., York—Pennsylvania Garage, M. Herman in charge—complete welding equipment, also paint spraying machine.

Alta., Edmonton—Douglas Printing Co., Ltd., Main St.—printing machinery and equipment to replace fire loss. Estimated cost $75,000.

B. C., North Vancouver—Review Printing Co., 110 East First St.—additional equipment for printing plant.

OPPORTUNITIES FOR FUTURE BUSINESS

Calf., Los Angeles—Lockheed Aircraft Corp., West San Fernando Rd., Burbank, Calif., plans to construct a new factory at Clybourne St. and Southern Pacific R.R. Estimated cost will exceed $37,500.

Calif., Los Angeles—Studebaker Motors Corp., 4530 Loma Vista Ave., has awarded the contract for an addition to its automobile body manufacturng plant. Estimated cost $1,000,000. Noted May 20.

Calif., Oakland—Union Autographic Register Corp., C. Norris, Mgr., 19th and Union Sts., is having plans prepared by Pereira & Pereira, Archts., 333 North Michigan Ave., Chicago, Ill., for the construction of a factory and office building at 34th and Beach Sts. Estimated cost $150,000.

Calif., San Leandro — Standard Trailer Co., Elmhurst, Calif., plans to construct 1 story, 50x125 ft. shop building at San Leandro Blvd.

Conn., Elmwood—Holo Krome Screw Corp., W. A. Purtell, Gen. Mgr., Bristol, Conn., has awarded the contract for a 2 story, 82x200 ft. factory on Brook St. Estimated cost $100,000.

Conn., New Britain—Landers, Frary & Clark, 47 Center St., have awarded the contract for a factory on Ellis Ave. for the manufacture of electric refrigerators. Estimated cost $250,000.

Ill., Chicago—Acme Industrial Co., 413 North Carpenter St., manufacturer of die maker supplies, has awarded the contract for the construction of a factory at Lake and Union Sts. Estimated cost $100,000.

Ill., Chicago—Federal Pipe & Supply Co., 900 South Campbell Ave., has awarded the contract for the construction of an addition to its plant. Estimated cost $50,000.

Ill., Chicago—Pheoll Manufacturing Co., 5700 West Roosevelt Rd., manufacturer of screws, plan to construct an addition to its plant. Estimated cost $100,000. A. S. Alschuler, 28 East Jackson Blvd., Archt.

Ill., Springfield — Allis-Chalmers Manufacturing Co., Milwaukee, Wis., plans to construct an addition to its plant for the manufacture of machinery and equipment of various kinds. Estimated cost $1,000,000. Helmle & Helmle, Springfield, Archts.

Ind., Anderson—Delco-Remy Co. will construct a 1 story, 200x200 ft. addition to its plant here. Work will be done by day labor and separate contracts.

Ind., Claypool — Claypool Machine Co. contemplates repairs and alterations to its plant and foundry. Estimated cost $45,000.

Ind., Fort Wayne—Red Magnet Wire Co., East Pontiac St., has awarded the contract for an addition to its factory. Estimated cost $45,000.

Ind., Indianapolis — Indianapolis Railways, Inc., J. P. Tretten, Mgr., 110 North Illinois St., will soon receive bids for 1 story, 165x365 ft. machine shops, 1 story, 70x225 ft. service building, 1 story, 156x300 ft. bus storage building, 1 story transportation and service building and 3 story warehouse and office building, at 1100 West Washington St. Estimated cost $750,000. Herbert Foltz, 1035 Architects and Builders Bldg., Archt.

Ky., Ludlow—Trumbull Electric Co., Ludlow, has awarded the contract for the construction of a plant. Estimated cost $45,000.

Mich., Detroit—Long Manufacturing Co., 2768 East Grand Blvd., plans to construct a 2 story addition to its factory for the manufacture of auto parts. Estimated cost $50,000. Albert Kahn, New Center Bldg., Archt.

Mich., Detroit — Wayne County Supervisors, Barlum Bldg., are having plans prepared by Le Roy Smith, Engr., Wayne County Road Comn., for the construction of a 1 story shop building at Wayne County Airport. Estimated cost $50,000.

Mich., Ecorse—Murray Corp. of America, 7700 Russell St., Detroit, will soon award the contract for the construction of a press shop for heavy stampings. Estimated cost $100,000.

Mich., Flint — A. C. Spark Plug Co., Flint, plans to construct an addition to its plant. Estimated cost $150,000.

Mich., Grand Rapids—Wolverine Brass Works, 620 Monroe St., N. W., has awarded the contract for an addition to its plant. Estimated cost $40,000.

Mich., Hamtramck—Dodge Bros. Corp., 7900 Joseph Campau Ave., plans to alter and enlarge its foundry building into manufacturing plant. Estimated cost $40,000. Smith, Hinchman & Grylls, Marquette Bldg., Detroit, Engrs.

Miss., Jackson — Reynolds Spring Co., Water St., has awarded the contract for an addition to its plant. Estimated cost $200,000.

Mich., Kalamazoo—Clarage Fan Co., Kalamazoo, has awarded the contract for an addition to its plant. Estimated cost $70,000.

Mich., Plymouth — Daisy Manufacturing Co., Plymouth, has awarded the contract for the construction of a 2 story addition to its factory for the manufacture of air rifles. Estimated cost $50,000.

Mich., Pontiac — American Forging & Socket Co., Branch St., has awarded the contract for a 2 story addition to its plant. Estimated cost $70,000.

Mich., Port Huron—Great Lakes Foundry Co., Moak St., contemplates the construction of a plant to replace the one destroyed by fire. Estimated cost $45,000.

Mich., Ypsilanti — United Stove Co. has awarded the contract for an addition to its plant here. Estimated cost will exceed $40,000.

Mo., Maplewood (St. Louis P.O.)—Alco Valve Co., Inc., 2628 Big Bend Blvd., has awarded the contract for a 1 story, 41x83 ft. addition to its factory. Noted June 17.

Neb., North Platte—Union Pacific R.R., H. C. Mann, Ch. Engr., 1416 Dodge St., Omaha, plans to construct additions to its shops here. Estimated cost $90,000.

N. J., Newark—Eric Johnson Forging Works, 293 Thomas St., contemplates the construction of a plant. Estimated cost including equipment $37,000.

N. J., Orange — Monroe Calculating Machine Co., 555 Mitchell St., has awarded the contract for the construction of a factory on Central Ave. and Jefferson St. Estimated cost $70,000. Noted June 17.

N. Y., Douglaston—The Bedford Boat Building Co., 342 East 34th St., New York, J. Kramer, Pres., plans to construct a boat building factory on Alley River. Estimated cost including equipment will exceed $37,000.

N. Y., Utica—Miller Electric Co., 11 Hopper St., has awarded the contract for a 3 story addition to its plant.

O., Cleveland — American Coach & Body Co., 3809 Clark Ave., plans alterations to its factory. Estimated cost including equipment $37,000.

O., Cleveland—Cleveland Twist Drill Co., East 49th St. and Lakeside Ave., plans to construct a 5 story, 220x300 ft. factory. Estimated cost $400,000. George S. Rider Co., Marshall Bldg., Cleveland, Archt.

O., Cleveland—Hydraulic Equipment Co., 1226 East 152nd St., has had plans prepared by E. G. Hoefler, 5005 Euclid Ave., for the construction of a factory. Estimated cost $28,500.

O., Dayton — Inland Manufacturing Co., Inland Ave., manufacturer of steering wheels, has awarded the contract for the construction of a factory. Estimated cost including new equipment $750,000.

O., Dayton—Standard Register Co. has awarded the contract for the construction of a press shop. Estimated cost $50,000.

O., East Liverpool—Patterson Foundry & Machine Co., St. George, has awarded the contract for an addition to its factory and machine shop. Estimated cost $50,000.

O., Sandusky — Sandusky Metal Products Co. plans repairs and alterations to its plant here. Estimated cost including equipment $37,000.

O., Toledo—City Auto Stamping Co., Lint Ave., plans to construct an addition to its plant. Estimated cost $75,000.

O., Toledo — Champion Spark Plug Co. has awarded the contract for a 6 story addition to its factory here. Estimated cost $36,000.

O., Warren—Packard Electric Co. has awarded the contract for the construction of two factory buildings here. Estimated cost $200,000. Noted June 17.

O., Wooster—United Engineering & Foundry Co. plans improvements to its plant here. Estimated cost $125,000.

O., Youngstown—Ohio Edison Co., South Ave., has awarded the contract for the construction of 2 story line shop and maintenance division building. Estimated cost $250,000.

Pa., McKeesport—Firth-Sterling Steel Co. has awarded the contract for an addition to its plant here. Estimated cost $250,000.

Pa., Pittsburgh — Mine Safety Appliance Co., 201 Braddock Ave., is having plans prepared by Prack & Prack, Archts., Martin Bldg., N. S., for the construction of a 4 story, 65x177 ft. factory building.

Tex., Houston — Rheen Manufacturing Co., Chesley St. and Southern Pacific R.R., Richmond, Calif., contemplates the construction of a factory at Houston, Tex., for the manufacture of steel drum containers. Estimated cost $100,000.

Wash., Seattle—Northwest Lead Co., 1742 4th Ave. S., has awarded the contract for the construction of a 1 story, 151x200 ft. and 80x150 ft. factory. Estimated cost $70,000.

W. Va., Wheeling—Wheeling Mold & Foundry Co. plans improvements to its plant here. Estimated cost $100,000.

Ont., St. Catharines—Welland Vale Manufacturing Co., is having plans prepared by A. E. Nicholson, Archt., 46 Queen St., for a new forge shop to replace the one destroyed by fire with a loss of $50,000.

Ont., St. Catharines—McKinnon Industries, Ontario St., subsidiary of General Motors Co. of Canada, Oshawa, has awarded the contract for the construction of a forge shop.

American Machinist

REFERENCE BOOK SHEET

©

American Standard Preferred Numbers

In 1927 the American Standards Association recommended a table of preferred numbers for trial by industry. Further study initiated in 1931 resulted in the proposed standard published for criticism in 1934 and reproduced in an earlier Reference Book Sheet (*AM*—Vol. 78, page 773). The final draft, approved April 14, 1936, is presented through the courtesy of the ASA and includes additional explanatory material. The table of decimal preferred numbers is shown on this page, and the table of fractional preferred numbers will appear in a subsequent number.

Purpose of Preferred Numbers

Preferred numbers are series of numbers selected to be used for standardization purposes in preference to any other numbers. Their use will lead to simplified practice and they should, therefore, be employed whenever possible for individual standard sizes and ratings, or for a series thereof, in applications similar to the following:

Important or characteristic linear dimensions, such as diameters and lengths.

Areas, volumes, weights, capacities.

Ratings of machinery and apparatus in horsepower, kilowatts, kilovolt-amperes, voltages, currents, speeds, power-factors, pressures, heat units, temperatures, gas or liquid-flow units. weight-handling capacities, etc.

Characteristic ratios of figures for all kinds of units.

Preferred Numbers System

In order to facilitate the standardization of a series of sizes or ratings along logical and rational lines, preferred numbers have been selected to have definite relations to one another.

Basic Preferred Numbers—Decimal Series (10 to 100)

5-Series 60% Steps	10-Series (25% Steps)	20-Series (12% Steps)	40-Series (6% Steps)
10	10	10	10
			10.6
		11.2	11.2
			11.8
	12.5	12.5	12.5
			13.2
		14	14
			15
16	16	16	16
			17
		18	18
			19
	20	20	20
			21.2
		22.4	22.4
			23.6
25	25	25	25
			26.5
		28	28
			30
	31.5	31.5	31.5
			33.5
		35.5	35.5
			37.5
40	40	40	40
			42.5
		45	45
			47.5
	50	50	50
			53
		56	56
			60
63	63	63	63
			67
		71	71
			75
	80	80	80
			85
		90	90
			95

Preferred Numbers below 10 are formed by dividing the numbers between 10 and 100 by 10, 100, etc.
Preferred Numbers above 100 are formed by multiplying the numbers between 10 and 100 by 10, 100, etc.
Percentage steps in headings are approximate averages.

Supplementary Series—Decimal Series (1 to 1000)

5/2 Series (150% Steps)	5/3 Series (300% Steps)	10/3 Series (100% Steps)	20/3 Series (40% Steps)	40/3 Series (18% Steps)
1	1	1	1	1
				1.18
			1.4	1.4
				1.7
		2	2	2
				2.36
2.5				
			2.8	2.8
				3.35
	4	4	4	4
				4.75
			5.6	5.6
6.3				
				6.7
		8	8	8
				9.5
			1.2	11.2
				13.2
16	16	16	16	16
				19
			22.4	22.4
				26.5
		31.5	31.5	31.5
				37.5
40				
			45	45
				53
	63	63	63	63
				75
			90	90
100				
				106
		125	125	125
				150
			180	180
				212
250	250	250	250	250
				300
			355	355
				425
		500	500	500
				600
630				
			710	710
				850

Preferred Numbers below 1 are formed by dividing the numbers between 1 and 1000 by 1000.
Preferred Numbers above 1000 are formed by multiplying the numbers between 1 and 1000 by 1000.

80-Series (3% Steps)	Other series in which numbers of 80-series appear			
10	40	20	10	5
10.3				
10.6	40			
10.9				
11.2	40	20		
11.5				
11.8	40			
12.1				
12.5	40	20	10	
12.8				
13.2	40			
13.6				
14	40	20		
14.5				
15	40			
15.5				
16	40	20	10	5
16.5				
17	40			
17.5				
18	40	20		
18.5				
19	40			
19.5				
20	40	20	10	
20.6				
21.2	40			
21.8				
22.4	40	20		
23				
23.6	40			
24.3				
25	40	20	10	5
25.7				
26.5	40			
27.2				
28	40	20		
29				
30	40			
30.7				
31.5	40	20	10	
32.5				
33.5	40			
34.5				
35.5	40	20		
36.5				
37.5	40			
38.7				
40	40	20	10	5
41.2				
42.5	40			
43.7				
45	40	20		
46.2				
47.5	40			
48.7				
50	40	20	10	
51.5				
53	40			
54.5				
56	40	20		
58				
60	40			
61.5				
63	40	20	10	5
65				
67	40			
69				
71	40	20		
73				
75	40			
77.5				
80	40	20	10	
82.5				
85	40			
87.5				
90	40	20		
92.5				
95	40			
97.5				

Although there are few applications requiring steps smaller than the 6% steps of the 40-series, such applications may occur. Therefore an 80-series, both decimal and fractional, has been adopted.

The numbers of this series should also be useful in many cases where it is necessary to standardize two values that should be rather close together and where a difference of 3% is suitable. One of the values can be chosen from one of the coarser series and the other can be the value of the 80-series immediately following.

American Machinist REFERENCE BOOK SHEET ©

American Standard Preferred Numbers

The proposed International System, which has also been approved by the American Standards Association, covers the so-called "5-, 10-, 20- and 40-series."

In the range from 10 to 100:

the 5-series gives 5 numbers approximately 60 per cent apart;

the 10-series gives 10 numbers approximately 25 per cent apart;

the 20-series gives 20 numbers approximately 12 per cent apart; and

the 40-series gives 40 numbers aproximately 6 per cent apart.

Numbers above 100 are obtained by multiplying those in Table 1 by 10, 100, etc.

Numbers below 10 are obtained by dividing those in Table 1 by 10, 100, etc.

A fractional system of preferred numbers over a limited range will be published in a subsequent number. It is based on the same general principle and may be used for linear dimensions in inches, where fractions are in such common use that decimals could not be readily applied.

An 80-series having 3 per cent steps is also given for decimal preferred numbers.

Supplementary series having numbers increasing by steps of 9, 18, 40, 100, 150, and 300 per cent can be formed by using certain numbers of the fundamental series.

Theoretical Basis for the Preferred Numbers System

A knowledge of the theoretical basis is not essential for the practical use of the system; it is explained here merely for the information of those interested. Preferred numbers are based on geometrical series. Using 10 as the first number of the series, the other theoretically exact numbers of any series are obtained by multiplying (or dividing) the first number by the constant factor applying to the particular series and repeating this operation with each resultant number. These factors are established as follows:

For the 5 series, $\sqrt[5]{10}$, or 1.5849

For the 10 series, $\sqrt[10]{10}$, or 1.2589

For the 20 series, $\sqrt[20]{10}$, or 1.1220

For the 40 series, $\sqrt[40]{10}$, or 1.0593

The formation of the various series may also be accomplished by starting with the 40-series and taking every other number to form the 20-series; every fourth number for the 10-series, and every eighth number for the 5-series.

Basic Rules

Although it is an essential feature of the preferred numbers system that it is based on geometric series, that is, each number is a given percentage larger than the preceding one, the use of geometric series of numbers other than those given here in the standard series should be avoided. *In order to further standardization, it is essential that the preferred numbers given in the tables be used.*

For a given line of articles or materials, the same series should be adhered to over as wide a range as possible, but a change from one series to another is frequently necessary in order to obtain the maximum utility and economy in the particular case involved. So far as possible, the numbers in the 5-series should be given preference over those in the 10-series; those in the 10-series, over those in the 20-series; and so on.

If it is entirely impossible to adhere to the basic percentages of 6, 12, 25, and 60, other percentages can be obtained from the supplementary series. These latter tables are made up of numbers contained in the main tables, supplemented by an 80-series.

Time of Application

When planning new designs, individuals and smaller industrial units should use preferred numbers as a basis whenever possible. If this practice is followed before standardization by larger bodies or before national standardizing agencies can function, it will greatly facilitate subsequent standardization by such bodies. When undertaking new work, standardizing agencies should always use preferred numbers as a basis. Where well-established and satisfactory standards exist, it is frequently not economical to make changes merely for the purpose of having the standardization conform to the preferred numbers system; however, if extensions are made to such existing standards or if changes are made for other reasons, preferred numbers should be used even though it can be done only to a limited extent.

Preferred numbers serve as a neutral ground in working out a revision of several standards of an article already in use that are either conflicting or too extensive to satisfactorily meet the demands of the industry. In "simplified practice," which is carried on in many industries and which usually consists in reducing the number of commercial sizes, preferred numbers can often be used by favoring those existing sizes that coincide with preferred numbers.

Application to Complete Machines and Devices

Preferred numbers should be applied to complete machines and devices in the manner which will result in the maximum interchangeability to the user and also facilitate a comparison of the products of different manufacturers. This means that they should be applied primarily to the commercial ratings most commonly used, such as horsepower and speeds. In the second place, they should be applied to important over-all and mounting dimensions or any other dimensions that will result in interchangeability to the user. Finally, the individual manufacturer may find it convenient to apply preferred numbers to characteristic dimensions and ratings that will facilitate standardization within his own sphere of activity.

Frequently certain devices have to be located within certain spaces with small clearances, and if in such cases preferred numbers cannot be economically applied to both the device and the clearances, they should preferably be applied to the device proper.

Part II of *"American Standard Preferred Numbers"* will appear in an early number.

Ideas FROM PRACTICAL MEN

Torches Help Railway Repairs

CLIFFORD H. FRENCH

An excellent example of the way in which the torch can be used in salvaging damaged locomotive parts was found in the St. Augustine shops of the Florida East Coast Railway. One of the results of the hurricane was to blow one of the large locomotives off the track, into the Gulf of Mexico, and to badly damage the front end. The cylinders were broken in several places, one break being clearly seen in Fig. 1. Beyond the broken cylinder is the welder at work on the other cylinder, which is inside the brick wall.

Fig. 2 is a close-up of the bricked-in cylinder, where it is being preheated and kept hot during the welding. These bricks are built around the cylinder into a sort of oven, an opening on the other side permitting a wood fire to be built next to or inside the cylinder to be welded. The cylinder is preheated to about 900 F. before welding and is kept hot. When hot enough an opening is made in the wall opposite the place to be welded, and the welder goes to work. As seen in Fig. 2, he is working through a comparatively small opening.

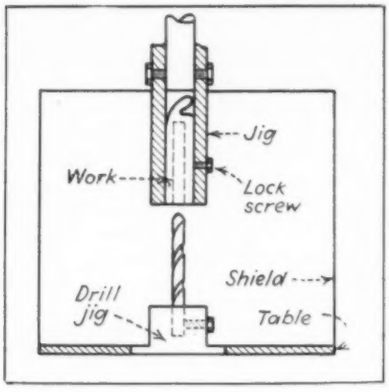
It would seem as though this might be a case where it would be cheaper to buy new cylinders. But the master mechanic assured me that this repair, including reboring, would not cost over one-third the price of a new pair of cylinders.

Similar methods of salvage were being used on steel underframes of locomotive tenders which had been badly twisted in the same wreck. By local heating with the torches and judicious straightening, almost unbelievable repairs are being made. In some cases the straightening can be done more easily by cutting out a portion of some member, making the necessary repairs, and welding in the old piece or even a new one.

Upside-Down Drilling

KARL ENGLISH
Buffalo Tool Company

A drop-forged pin required an axial drilled hole ½-in. in diameter almost all the way through the stock. The top end has a peculiar shape as shown by the accompanying illustration and drilling in the regular way was unsatisfactory, as the hole would not come concentric. The drilling process was reversed, using a stationary drill locked in the drill table, and a jig was



made to fit the spindle. A shield retainer was welded around the table and the drill, jig and pin immersed in soda water while drilling. The results were excellent.

Ball Indentations for Hole Transfer

OCTAVE ANTONIO

A frequent problem in tool work is that of transferring dowel pin and screw holes which have a blind bottom to another piece of work. For this purpose I keep a collection of steel balls ranging in size from ⅛ to ½ in. These are used in the following manner:

Suppose a block contains two ¼-in. dowel pin holes and two ¼—20 tapped holes by means of which another plate is to be attached to the block. A $\frac{5}{32}$-in. steel ball is set in the top of each hole and the plate placed on top. If the plate rocks slightly the highest ball is given a slight tap, or if this does not fix it the hole containing it is given a light touch with a countersink. In almost every case the balls can be quickly

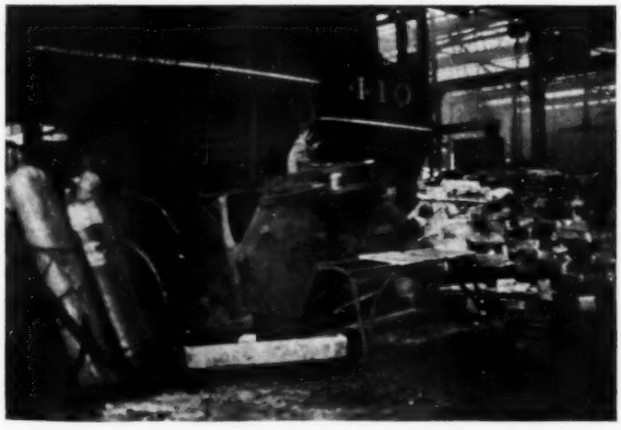


Fig. 1—A large V-shaped chunk was broken out of the cylinder in the foreground, but a welded repair was cheaper than a new cylinder. Fig. 2—Kept hot in a loosely built brick oven, the cylinder is repaired through a small opening

leveled. The plate is then placed on top in the proper position and given a light tap with the hammer or a light squeeze under the arbor press.

Upon turning the plate over the neat indentations of the four balls are seen. They are prick-punched in their exact centers and drilled. For spotting in prick-punch marks use a long-set type ⅛-in. drill with a fine point. Such a drill is limber and will follow the punch mark without deforming it as a stiff drill would do. This method is better than setting the work on balls or rollers and works especially well with heavy or irregular pieces.

Adjustable Parallels for Duplicate Settings

F. MUIR
Hamilton, Ontario

Ordinary adjustable parallels must be set exactly the same or they are useless, even though the required height need only be approximate. To overcome this difficulty and to obtain duplicate settings automatically, I made the pair of parallels illustrated. Each consists of two wedge-shaped members *A* and *B*. The top member *A* is tongued, while the lower member *B* is grooved. In addition there is a small groove *C* in one side of the tongue. Three flat-head machine screws *D* are inserted into tapped holes in member *B* from the inside of the groove. These screws have slot cut in the end so that the screw head can be caused to bear against the bottom of the groove in the tongue, thus tightening both halves of the parallel together. Flat-head screws are used because they are cheap and the plain heads make a better tightening face in a groove than the screw end. They do not burr and they cannot come out.

So that both parallels will be set exactly the same, the holes *F* are drilled and reamed in both members of each parallel. When the parallels are to be adjusted, I hold them close together and push two bars *H* into the holes. This gives the rigidity of a single structure. The bars are not removed until the screws are tightened by means of the slots on the outside.

Some mechanics may prefer a short bar driven in one parallel and protruding a little way so it enters the holes in the other. This would obviate the necessity for looking for bars when the parallels need setting.

An Aid to Slug Ejection

J. E. MILLER

Difficulty was experienced in ejecting the slug from a large pierce and form die by means of a spring pad. The piercing punches had $\frac{3}{32}$ in. shear and the metal was 18 gage. The theoretical spring pressure was insufficient to eject the slug, and doubling the pressure only caused part of the slugs to be ejected.

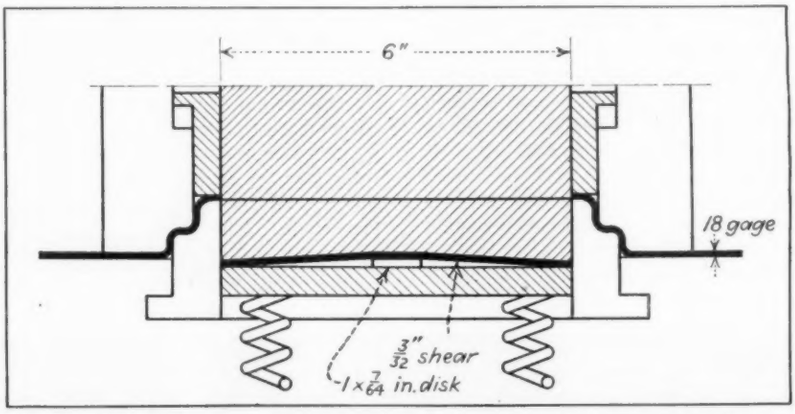
Analysis of the problem led me to believe that the difficulty arose from the angle formed in the slug by the shear on the piercing punch. When the ejector plate operated, it tended to straighten out the slug which resulted in the slug becoming wider than the die. This could have been corrected by forming the ejector plate to the same shape as the piercing punch. The job was in the press, however, and to make the correction would have entailed several hours of work and subsequent delay. Therefore, I tried the expedient of placing a 1-in. diameter disk with a thickness of $\frac{7}{64}$ in. in the center of the ejector plate. This solved the difficulty because a crown was produced in the blank on the ejection stroke, and if anything the slug was freer than it was on the downward stroke.

The disk was merely laid on top of the ejector plate for the few pieces required for the die tryout. When the die was removed from the press, it was a simple matter to fasten the 1-in. disk in the center of the ejector plate with a small flat-headed screw.

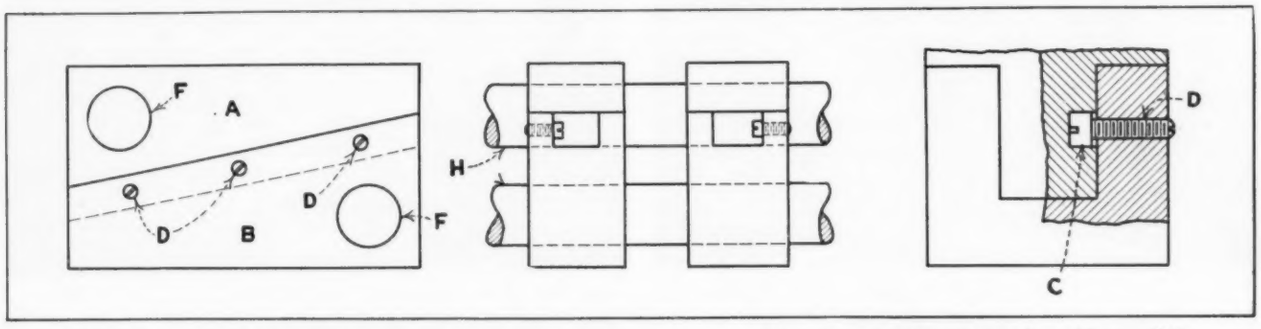
Two-Way Clamping Wedge

PHIL. E. VERAA

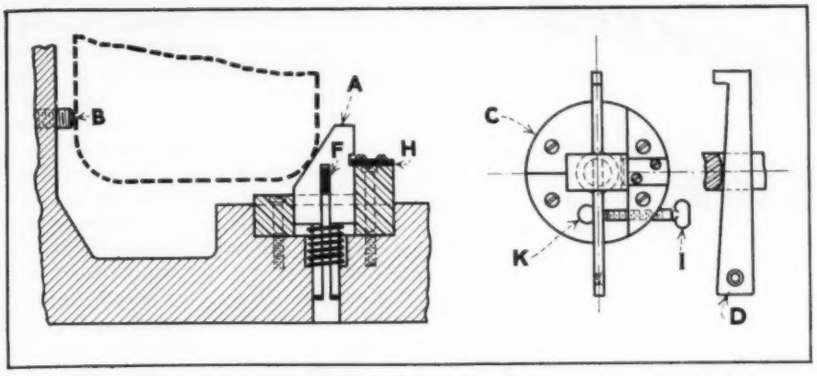
The wedge shown at *A* lifts the work and locates it sidewise at the same time. A shank is turned on the lower end of the wedge and is a sliding fit in the base of the fixture where a strong spring forces both the wedge and the work upward and sidewise, so that the work contacts the upper locating points (not shown) and the side stop *B*. The spring also serves as a cushion for the work when loading the fixture.



A 1x$\frac{7}{64}$-in. disk centered on the flat ejector plate aided in removal of the pierced slug from the die



Instead of expensive dove-tail construction, a tongue and groove are used for these double-setting adjustable parallels



The work is clamped by driving the wedge D into a slot in wedge A, forcing the work upward and sidewise against stops at the same time

The wedge is a sliding fit in the circular block *C* attached to the fixture base. After loading the fixture, the wedge *A* is locked and the work is clamped by driving the wedge *D* into the slot *F*. The stop plate *H* prevents wedge *A* from falling out when the fixture is empty. The thumbscrew *I* banks wedge *D* against the flat side of pin *K* and prevents it from becoming loosened.

Drilling a Hole Deeper Than the Drill Length

F. M. A'HEARN

In discussing the article by Malcolm K. Parkhurst under the title given above (*AM*—Vol. 79, page 330), J. T. Towlson (page 865) inquiries how a drill can be withdrawn from a hole deeper than its length when it is held by a screwdriver inserted in a slot in the end of the shank.

I see no difficulty in following Mr. Parkhurst's method. In fact if one hole only is to be drilled, it is preferable to sweating an extension on the shank of the drill, as Mr. Towlson suggests. The problem of the drill remaining in the hole instead of being withdrawn by the screwdriver each time the chip accumulations are to be removed from the flutes will be non-existent if the screwdriver, or if more convenient, a piece of drill rod, shaped as shown in the accompanying sketch is used.

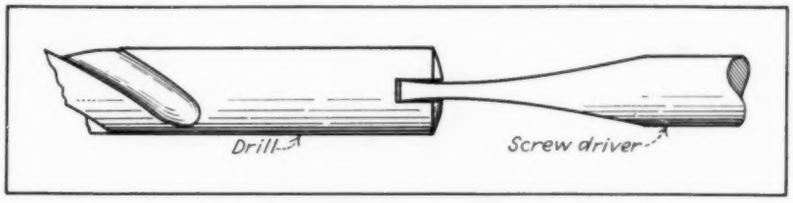
Referring to the sketch, it will be seen that the thickness of the screwdriver diminishes slightly away from the end. If the end of the screwdriver is slightly thicker than the width of the slot in the drill shank and is forced into the slot transversely, the fit will be sufficiently tight to withstand a husky pull in withdrawing the drill.

The success of a job of the nature described, when attempted with appliances most readily available, depends possibly 20 per cent upon the equipment and 80 per cent upon the intelligent use of improvised tools and a wholesome disregard for unproved impossibilities.

Punches That Avoid Deflection in Piercing

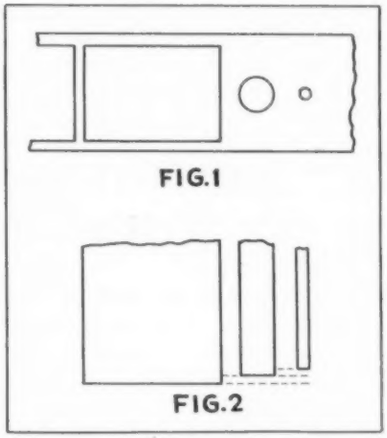
R. H. HANDLEY

When press tools have to be pulled out of a press in the middle of a run because of some defect in design or workmanship, the pressroom foreman has just cause for being peeved. One cause for such trouble is neglect of the designer to allow for the slight expansion or stretching of the stock in certain progressive blanking and piercing and multiple piercing operations. Where small holes are to be pierced near where a blank is to be cut out, or near a large hole to be pierced, as in Fig. 1, the punches should be of different lengths, as in Fig. 2, in which the spaces between the dotted lines are equal to the thickness of the stock.



If the point of the screwdriver is made as shown and is forced transversely into the slot, the fit will be tight enough to withstand a husky pull in withdrawing the drill

If the punches are all of the same length, the tools will not run long before the small punches will have the appearance of having been badly sheared into the die. In reality, the edges have been dulled on the upstroke of the ram by being continually presesd against one



In progressive blanking and piercing, the piercing punches should be shorter than the blanking punch and of different lengths so as not to enter the stock at the same time

side of the die openings, due to deflection by expansion of the stock in the blanking operation.

For the same reason, where work is to be formed and pierced, and where the depth to which the punches may enter the die is limited by a countersinking or similar operation, and forming punch should be mounted on the stripper and be backed by rubber or springs stiff enough to do most of the forming before the piercing punches enter the stock.

Mushroomed Chisel Heads

O. D. BRADSHAW
St. John, New Brunswick.

Referring to the article by Stanley Baldwin under the title given above (*AM*—Vol. 80, page 360), if when cold chisels were being hardened and tempered, the heads were given practically the same treatment there would not be any danger of flying splinters from them.

For several years I have hardened and drawn the heads of all my cold chisels. First I grind the bodies at the head ends slightly tapering. Then I harden them in oil at the critical temperature and draw them to a very dark blue, or at about 600 F. This treatment renders the heads hard enough to stand up without mushrooming under heavy hammer blows, and yet they are not hard enough to crack and splinter.

Shop Equipment NEWS

Pratt & Whitney High-Speed No. 12B Vertical Miller and Profiler

Pratt & Whitney Division, Niles-Bement-Pond Company, Hartford, Conn., announces a high-speed vertical miller and profiler called the No. 12B. The machine is available with either one or two spindles, and can be supplied either as a single-purpose machine or as a general-purpose machine, according to the work to be done and the spindle speeds desired.

As illustrated the machine is similar in general appearance to previous Pratt & Whitney profilers in that the spindles travel longitudinally on a cross-slide while the table travels transversely between the two columns.

Each spindle has its own driving motor which is mounted vertically on a hinged bracket at the rear of machine and drives the spindle through multiple V-belts. The motor-mounting brackets are hung on ball bearings and swing very freely. Belt tension is maintained by a radius rod and turn-buckle for each motor which adjusts the driving belt tension as desired.

When supplied as a general-purpose machine, the spindles are driven individually by four-speed motors, with motor and spindle pulleys interchangeable. This produces eight spindle speeds of 300, 450, 600, 900, 1,200, 1,800, 2,400 and 3,600 r.p.m. This wide range of high speeds equips the machine for cutting almost any material efficiently.

As a single-purpose machine, constant-speed individual motors are used with step pulleys, providing four spindle speeds. According to the motor speed specified the spindle speeds are as follows:

Motor r.p.m.	Spindle speeds, r.p.m.
600	300 to 1,200
900	450 to 1,800
1200	600 to 2,400
1800	900 to 3,600

In either case the spindle driving motors are 1 hp., 50 or 60 cycle a.c. The drive pulleys are mounted on ball bearings which are lubricated by two sight-feed oilers on top of the head. A third and larger sight-feed lubricates all the slides in the head and cross-rail.

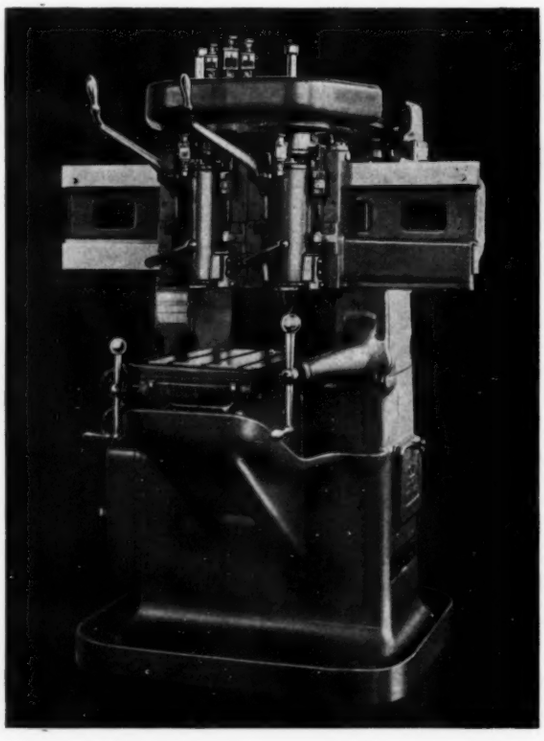
The spindles are mounted in slides and have a vertical travel of 4½ in. Minimum distance from the table top to the spindle end is 3½ in. and the maximum distance 8 in. Each spindle is mounted in two preloaded super-precision ball bearings at the bottom and a single floating ball bearing at the top. A built-in spring acts as a counterweight to offset the weight of the spindle and slide.

Cutters are held in the spindle nose by a drawbar operating from the top of the machine. By turning it in the opposite direction this drawbar also functions as a positive knockout for cutters. This eliminates driving the cutters out with a lead hammer with the attending strains on the spindle bearings.

The spindle slides are traversed vertically by large levers convenient to the operator. The cross-slides are provided with weight-compensating rolls which make the feed very sensitive and easy to operate. Positive, vertical, adjustable stops are provided, each having a dial graduated in thousandths. A horizontal lever in front of each spindle locks the spindle slide in any desired position. One former-pin block is provided on the left spindle, and two on the right spindle. The spindle head slides on a cross rail.

The table rides on one truncated V and one flat way and is strapped in place. Both the table and cross-slide are operated by suitable levers through a rack and pinion drive, and these controls are ball-bearing mounted throughout. All electrical control apparatus is mounted in a compartment at the left of the bed reached through a hinged cover. Individual motor controls are provided for the four-speed motors, and push buttons for starting and stopping are mounted on the side of the left-hand column.

The table working surface measures 14x18 in. and the table travel is 20 in. There is an 8 in. clearance between the table top and the bottom of the cross-slide. The cross-slide transverse movement is 22½ in. for the two-spindle machine and 27½ in. for the single-spindle machine. The distance between the two spindles is 12 in., and the distance between the spindle and the guide pin is 4⅛ in. The total distance between the uprights is 20 in. No. 9 B&S taper holes are provided in the spindles. The approximate net weight of the single spindle machine is 3,900 lb., and of the two-spindle machine is 4,460 lb. Both machines occupy a floor space of 68x70½ in., and are 78½ in. high.



Special equipment is available consisting of adjustable cross-slide stops, adjustable table stops and raising blocks for increased capacity.

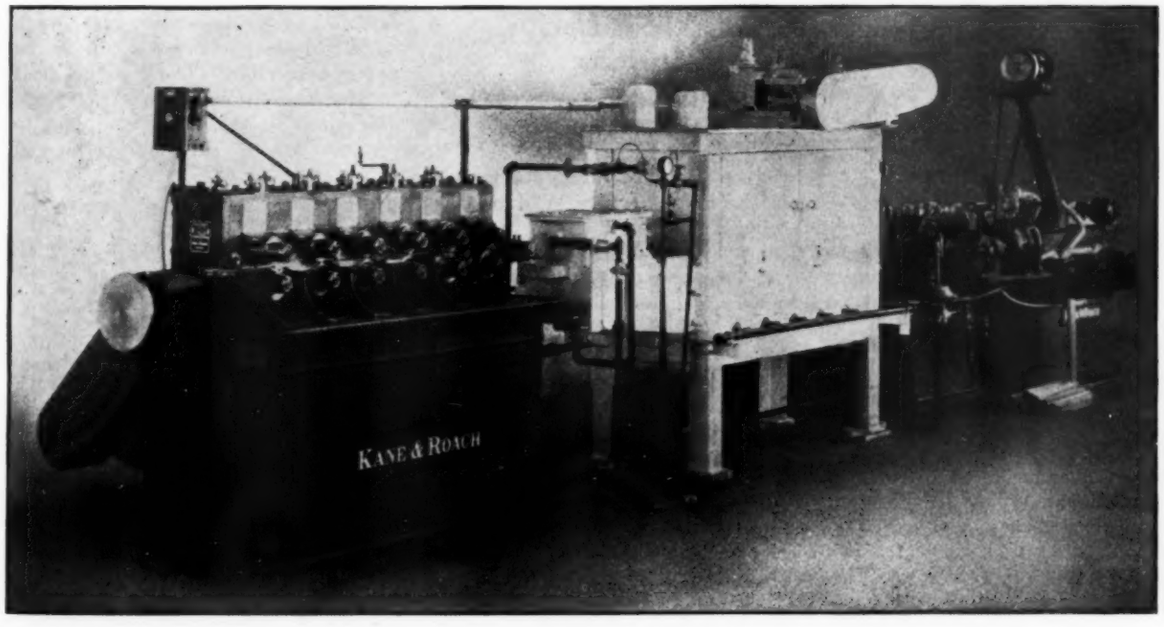
Kane & Roach Radiator Tube-Forming Machines

Two types of machine set-ups for forming radiator tubes have been developed by the Kane & Roach, Inc., Syracuse, N. Y. Fig. 1 shows a cold-roll forming machine of the outboard housing type, known as Series X, and also No. 3 flying saw. The forming machine forms lockseam radiator tubing from copper ribbon stock, 0.006 and 0.008 in. thick, into a tube ½ in. high by 0.093 in. thick. The tube is formed at a rate of 300 ft. per min. It then passes through the tinning machine where it receives a solder coating of 0.001 to 0.00125 in., and then passes into the saw. This machine is designed for cutting the tubing into long lengths, approximately 20 to 40 ft. or longer. The tubing is then cut into individual multiples.

A second set-up consists of a No. 00L 6-150 cold roll forming machine of the yoke type, Series L tinning machine, No. FD straightening machine and rotary cutoff as shown in Fig. 2. Rectangular lockseam radiator tubes are formed from brass strip stock 0.0075 in. gage, the tube being 0.531 in. high by 0.093 in. thick. Another tube of the same outside dimensions can also be made from 0.0095 in. gage material, and a further product is a round lockseam overflow tube 0.031 in. O.D., rolled from brass strip 0.015 in. thick. This machine operates at a production of 110 ft. per min., the tube passing from the forming machine through the tinning machine, where it is solder coated. It then passes through the No. FD straightening unit which is power driven, and from there into the rotary cutoff where the rectangular tubes are cut to lengths of 20⅞ in. All electrical equipment in this set-up is wired in series, so that should any motor overload, or be cut off, the entire electrical equipment is automatically shut down.

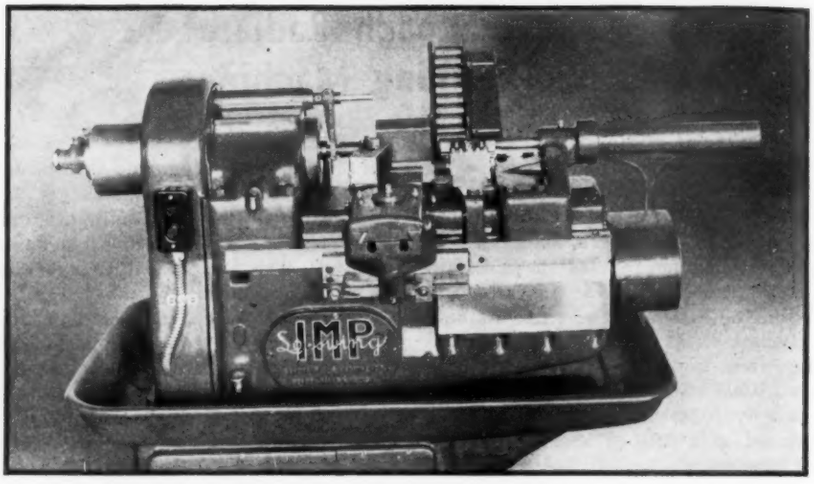
Fig. 1—Long lengths of rectangular radiator tube are produced in this set-up which shows the material being drawn from the coil and fed into the forming machine

Fig. 2—In this set-up the tinning machine is included, being equipped with automatic thermostatic control



"Lo-Swing Imp" with Safety Handling Devices

Reduction in the accident hazard and higher production have been secured by the Seneca Falls Machine Co., Seneca Falls, N. Y., by equipping some of its "Lo-Swing Imp" automatic lathes with its patented automatic safety work-handling devices. The machine illustrated is one of several in use on a bronze-bushing job. In operation, the work chute is kept filled by the operator and the work is fed automatically to the work-holding arbor for machining. After the work is machined, the tool withdraws and returns automatically to the starting point while simultaneously the finished work is stripped from the mandrel and discharged into a work chute as the next piece is loaded into the arbor.



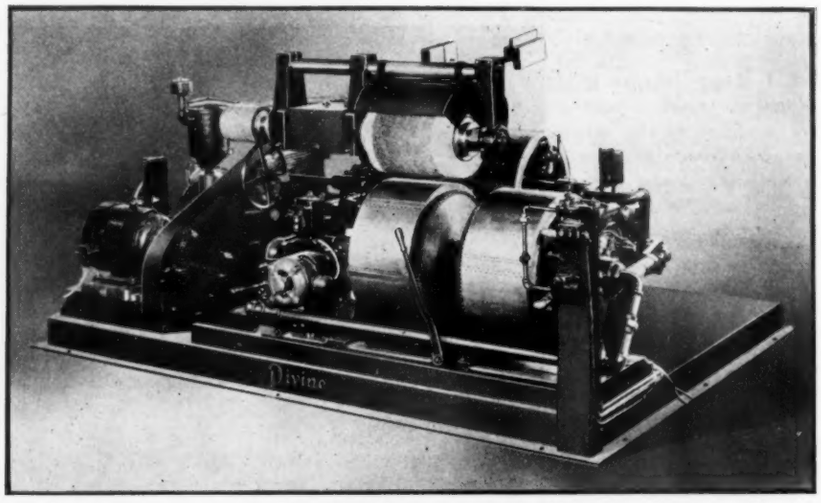
Work is automatically fed to the work arbor and stripped therefrom, providing greater safety for the operator

Divine Brothers Sheet Buffing Machine

Divine Brothers Co., Utica, N. Y., has designed a sheet buffing machine for use by metal-products manufacturers to buff metal in the sheet before fabrication wherever this method lends itself to the production scheme. This machine is suitable for buffing both tubes and sheet stock before forming and then touching up the part after forming in order to save the expense of buffing a formed part. Ferrous and non-ferrous sheets are cut-down or color buffed, or satin finished more rapidly. Through positive control of buff pressure and time of contact with the work, a finer finish is achieved. Sheets in any size ranging up to 16 in. wide by 7 ft. long by 0.020 in. thick can be taken by the standard machine.

The work is placed on a revolving drum which brings it in contact with the buffing wheel. Sheets are held on the drum by vacuum or magnetic chucks. Two drums, shifted by an air cylinder, allow for loading one drum while the other is in process, thereby giving practically continuous production.

The wheel spindle takes a buff 18 in. in diameter by 18 in. face, and is provided with a mechanism to oscillate the buff, thereby eliminating streaks in the work. A lever permits disengagement of the oscillator when not required. A variable speed V-belt drive permits 50 per cent variation in wheel speed, allowing buffs to be used at maximum efficiency even when worn down. Drive is furnished by a 20-hp. motor, and the machine comes in sections for easy handling.



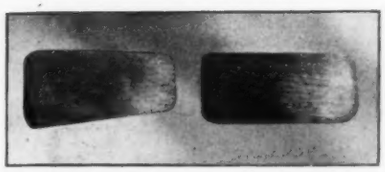
Quick adjustment of the buffing wheel is secured by handwheels, and an air cylinder lifts it from the work on this Divine buffing machine

De Vilbiss Fluid Strainer

The DeVilbiss Co., Toledo, Ohio, has developed Type "VS" fluid strainer to attach to the fluid inlet of the "MBC" spray gun. A slight residue of material in the line may be carried to the spray gun if the paint is not strained at the last point before entering the gun, it has been found. This may cause defects in the finished surface, unless the strainer is at the fluid inlet.

The simple working part of the strainer consists of a screen reinforced with coiled spring. This is inclosed in a metal tube. Fluid flow is from the outside to the inside of the screen, easily removable for cleaning.

Type VS strainer is connected by its upper, or outlet, connection to the fluid inlet connection of the spray gun. The lower, or inlet, end of the strainer, to which the fluid hose is connected, is fastened to the lower end of the gun handle to prevent undue strain on the upper connection. The latter is bent to give the strainer the proper angle for attaching the fluid hose, and to run parallel with it, making the gun easy to handle.



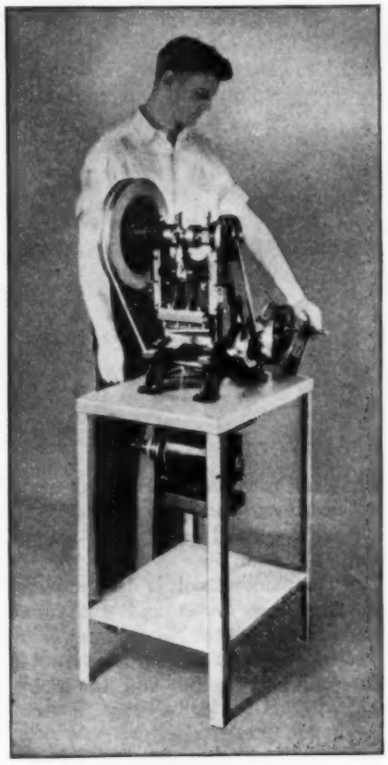
Spring steel wire of keystone cross-section, as at the left, assumes a rectangular cross-section at the right when coiled, to give equal strength of both inside and outside spring diameters

Danly Die Spring

An entirely new type of cross section for die springs is announced by the Danly Machine Specialties, Inc., 2104-2130 South 52nd Ave., Chicago, Ill. The spring is coiled from keystone wire which, when coiled assumes a rectangular cross section, developing the full strength of the wire, increasing flexibility, travel and fatigue life. A spring steel wire of special alloy is employed. Coiling is done by automatic machinery, following which each spring is heat-treated by a special process and then japanned.

Southwark Hydraulic Die-Spotting Presses

The actual load applied in testing dies is shown by the hydraulic die-spotting presses announced by the Baldwin-Southwark Corporation, Philadelphia, Pa. Hydraulic pressure is controlled by a safety valve set at a pre-determined load, and a gage shows the pressure applied. The presses are the moving-down type, the platens being actuated by two hydraulic rams, one in each column. Rams are either single or double acting, in accordance with the work to be performed. When the dies are only required to be closed, single-acting rams suffice, but when real pressure must be placed on the dies the double-acting rams are used. Hydraulic power is derived from a pump mounted in the top cross member.



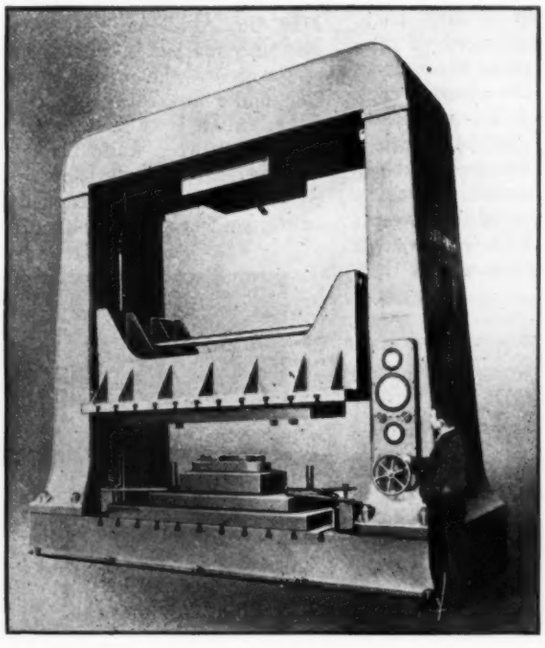
A four-speed drive gives from 6,000 to 18,000 strokes per hr.

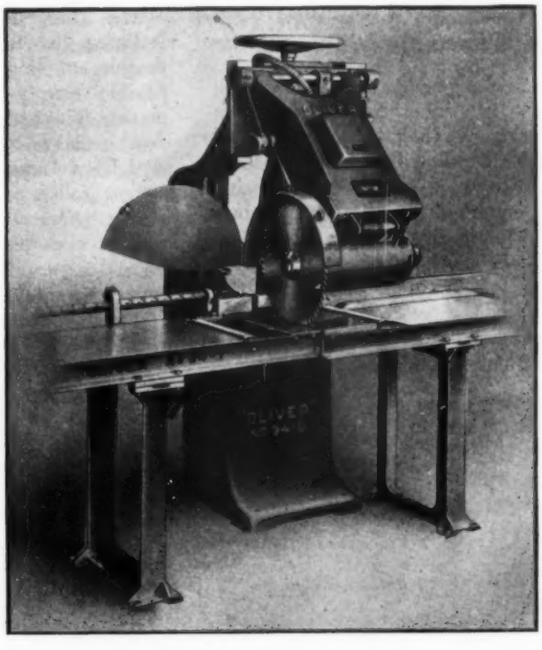
"Flexopress" Bench-Type Power Press

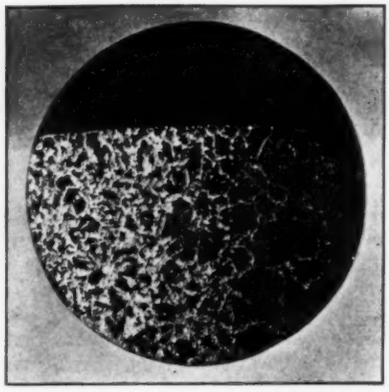
Three types of work can be done on the small Model 400 "Flexopress" built by Flexo Machines, 2226-2230 North Racine Ave., Chicago, Ill. This press can be used for high-speed production of very small, light stamped parts such as clips, connectors, spacers and washers. A second application is the cutting of production materials to uniform lengths up to 9 in. The machine handles wire, light metal and rolled material at high speed. A third application is the high speed and continuous perforating of metal, paper, cloth and foil. The press is entirely automatic and one operator handles it.

"Straitline" Cut-Off Saw

Either a steel saw or an abrasive disk can be applied to the "Straitline" cut-off saw made by the Oliver Machinery Co., Grand Rapids, Mich., for cutting steel and other metals. The machine is built in two models, one for straight right-angle cuts only, and the other with a swivel column to make angular cuts up to 45 deg. right and 15 deg. left. The machine saws metal tubing, molding, strip and composition. An accurate link motion provides straight-line operation of the saw. Light-gage steel sections, having a maximum height up to 4½ in., may be cut off using an 18-in. metal saw. The machine can be placed against the wall and takes up only 18 in. from the wall to the back edge of the cut-off table. Total height is 5 ft. 8 in.







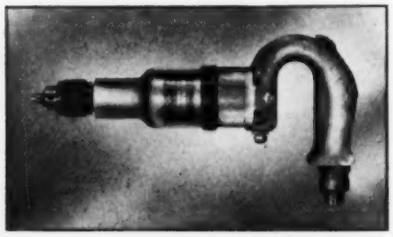
Sharpness of the line between the hardened case and the soft area indicates the selective hardening possible with K-Seal

K-Seal Carbon Penetration Preventative

A coating material for application to steel before carburizing to prevent carbon penetration has been developed by the Lindberg Engineering Co., 221 Union Park Court, Chicago, Ill. This material, "K-Seal," is supplied in the form of a powder and a liquid which are mixed in definite proportions and must be applied to surfaces free from oil. If machining or straightening are to be done on a part in the hardened condition, the application of K-Seal before carburizing will keep the painted section soft where this machining or straightening is to be performed. The material adheres tightly and very sharp boundaries can be obtained. It is applied by dipping or brushing.

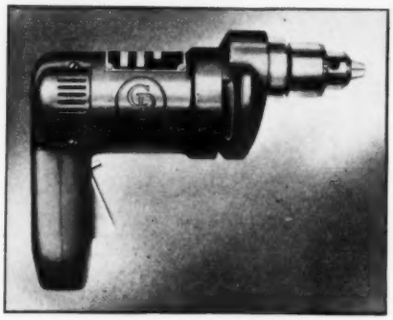
Hercules ¼-In. Pneumatic Portable Drill

A Hercules pneumatic portable drill with a ¼ in. drilling capacity has been announced by the Buckeye Portable Tool Co., Dayton, Ohio. This Model 016-4 drill weighs only 4¼ lb., being made of light alloys. It can be operated entirely by one hand, a convenient thumb lock throttle being conveniently placed. The air motor operates the chuck spindle direct through planetary gears, and the tool is equipped with ball bearings throughout.



"CP" Midget Electric Drill

A universal electric tool for 3/16-in. drilling is offered by the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y. It fits the hand and is comfortable to hold. The over-all length is only 7 1/16 in., and the weight is only 2 lb. 10 oz. The spindle offset is small and the weight is well balanced. This drill has such features as: two-pole switch with trigger and lock; brushes, commutator and connections

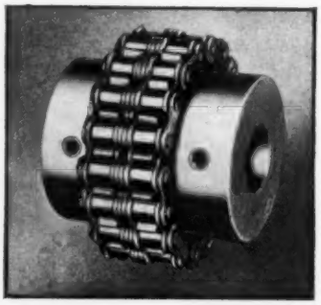


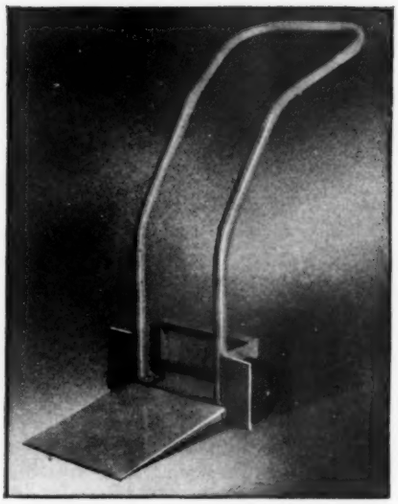
accessible with motor running; sealed ball-bearings; hardened helical gears; full-size cord and cord protector; ventilating system.

A companion tool is the universal electric screw driver and nut runner for driving up to No. 8 screws and 3/16-in. nuts. The length over-all of this tool is 10⅝ in., and the weight is 3½ lb.

Diamond Improved Flexible Coupling

The Diamond Chain & Mfg. Co., Indianapolis, Ind., has improved its flexible coupling said to be the oldest flexible coupling of the chain type made. The coupling of the new series now consists of two sprockets encircled by a length of Diamond double-strand roller chain, instead of single strand. Clearance is provided between the sprocket teeth and the chain side plate to permit misalignment of the connected shafts.



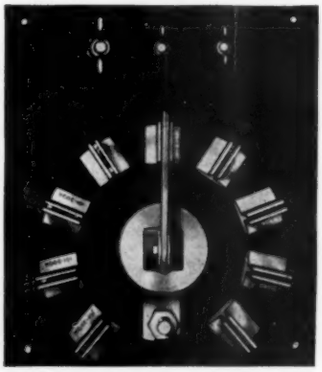


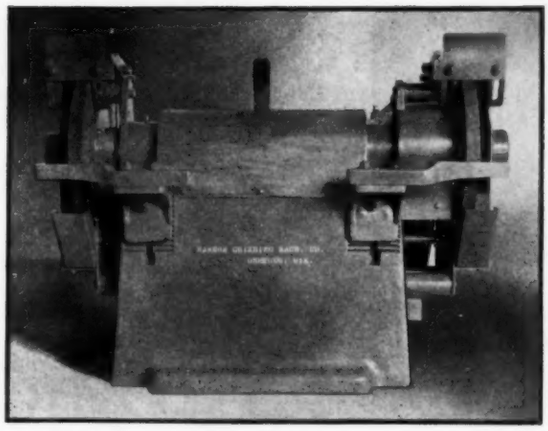
Pollard Shovel Truck

A shop box filled with parts can be picked up from the floor and moved without spilling its contents by means of the shovel truck developed by the Pollard Bros. Mfg. Co., 4444-52 N. Knox Ave., Chicago, Ill. This truck works like a shovel. It is pushed under the load with the foot, and the load is pushed off with the foot. It will handle barrels, boxes, cartons, kegs and bags. The balance is correct for lifting and trucking.

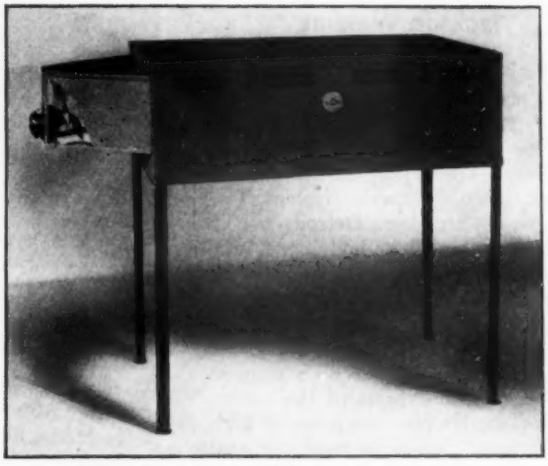
Miller Rotary Knife Welder Switch

A rotary knife switch control for a.c. welders which bring all the amperage changes under one switch arrangement, has been developed by Miller Electric Mfg. Co., Appleton, Wis. The dial is distinctly marked in ampers so the operator knows what amperage he is getting under any setting of the switch. Knife switch is of heavy construction. Contact between knife blade and the welding lead is made through a large copper disk of heavy capacity. The switch can be rotated in either direction.

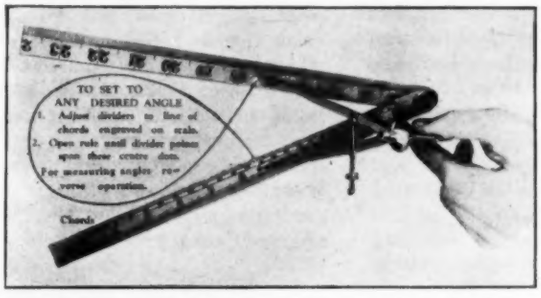




Right-hand wheel is slipped off and the sheave changed when a speed change is desired



Blueprints up to 24x36 in. are printed at low cost on this Milligan & Wright machine


TO SET TO
ANY DESIRED ANGLE
1. Adjust dividers to line of chords engraved on scale.
2. Open rule until divider points upon these centre dots.
For measuring angles reverse operation.
Chords

Inches and chords for angles to 120 deg. afford quick shop layout of dimensions and angles

Ransom Type C High-Speed Grinder

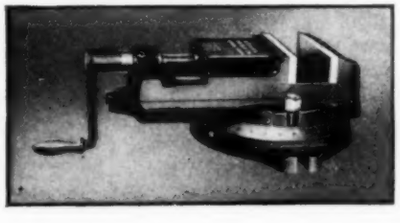
A floor-type grinder using 24- or 30-in. high-speed wheels is available from the Ransom Grinding Machine Co., Oshkosh, Wis. There are four changes of speed accomplished by means of changing the sheaves on the 15-hp. motor. Drive to the spindle is by Texropes and new ones can be installed without disturbing the arbor. The speed is controlled and so arranged that it is apparent from the front of the machine when the next larger size of sheave should be put on to speed up the wheels.

Chesterman Stainless Steel Rule for Lay-Out

Angular as well as linear measurements can be made quickly by use of the "Chesterman" precision stainless steel rule being marketed in the United States by the George Scherr Company, 128 Lafayette St., New York, N. Y. This jointed rule serves as a protractor and can be set quickly and accurately to any desired angle. There is a line of chords engraved on one side of the rule from 0 to 120 deg., advancing by ½ deg. The rule is also provided with two center dots, one on each blade by which, with the aid of a pair of dividers, the rule can be set to any desired angle or any angle can be determined. The joint is provided with a spring tension to hold the angle setting rigid for scribing and layout work.

Athol Milling Machine and Drill Press Vise

An easily removable swivel indexing base is employed on the milling machine vise announced by the Athol Machine & Foundry Co., Athol, Mass. When used with the indexing base, the vise is suitable for milling-machine and other operations requiring accurate angle settings. When removed from the swivel base, the vise is suitable for drill press use and other operations. The indexing base is graduated over 180 deg. extending 90 deg. each way from zero. The vise is available in two sizes, with 4 in. jaws and with 6 in. jaws.



Milligan & Wright Large Blueprinter

A model double the size of previous machines has been added to the line of Angstrom lamp blueprinters manufactured by Milligan & Wright Co., 1209 West Third St., Cleveland.

Essential features of the older model are retained, including the use of incandescent lamps as a light source and elimination of the belt feed by the flat bed printing surfaces. The new unit is 24 x 36 in. Forced ventilation prevents any tendency to overheat. Prints cost about 1.3 cents per sq.ft.

"Hipress" Air Hose

Three sizes, ½, ¾ and 1 in., are available in "Hipress" air hose, made in lengths up to 500 ft. by the B. F. Goodrich Co., Akron, Ohio. This product, designed for all types of air tool applications, has an inner carcass which consists of four plies of specially woven duck. The outer carcass is a tight braid of high tensile cords applied with a tension ten times that normally used on long-length braided hose. Between the outer and inner carcasses is an insulation which serves as a secondary tube to seal off penetration of air through the walls of the hose and to cushion blows from the outside. The tube is made of a special rubber capable of resisting both oil and heat.

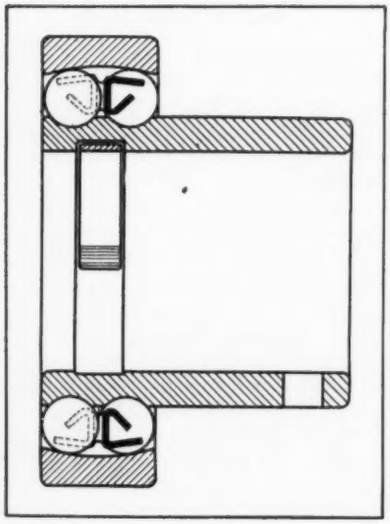
Jackson Welding Electrode Holder

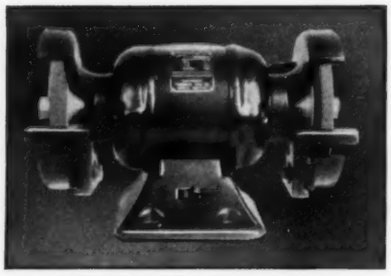
To provide a maximum degree of safety for the operator and protection for the work and to provide longer and more economical holder service, the Jackson Electrode Holder Co., 6553 Woodward Ave., Detroit, has introduced a model embodying several improvements. Like previous Jackson holders, it is completely insulated, air circulation being provided between insulation and metal for coolness. A special copper alloy has been adopted for the structural parts of the holder. The replaceable jaws are made of Mallory 3 metal, which is used for spot welding tips.

SKF Grip-Lock Bearing

SKF Industries, Front St. & Erie Ave., Philadelphia, Pa., has added a "Grip-Lock" bearing to its line. It offers the advantage of quick, simple application without tools and insures a bearing positively locked to the shaft.

Essentially, the bearing is a conventional SKF self-aligning extended-inner-race bearing with an eccentric groove machined in the bore of the inner race. Fitted in the groove is a piece of spring steel known as the "Grip-Lock Shoe." When the shoe is in the deepest part of the eccentric groove, the bearing may readily be slipped on the shaft. Then, by holding the inner race of the bearing while the shaft turns in the direction of operation, the knurling at the ends of the grip-lock shoe grip the shaft, causing the shoe to wedge in the shallow part of the groove, thus locking the bearing on the shaft.





Thor Model BG66 6-In. Bench Grinder

General grinding, polishing, buffing and wire-brush work can be performed on the Model BG66, 6-in. bench grinder introduced by the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill. The tool rest can be adjusted to various positions and heavy wheel guards are furnished. The motor can be had for 110 or 220 volts, and the free speed is 3,550 r.p.m.

Surface Combustion Forging Furnace

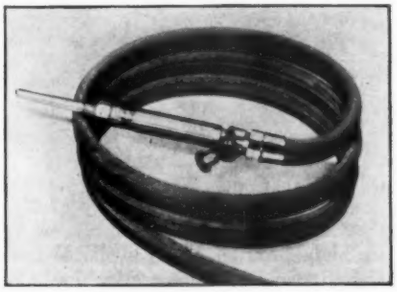
The Ziz Commission, manufacturer of motor trucks, Moscow, Russia, recently purchased from the Surface Combustion Corp., Toledo, a continuous slot-type forging furnace. Built to burn either gas or oil, this furnace has capacity of heating 5 in. of the end of motor valve rods, $\frac{3}{8}$ in. or $\frac{1}{2}$ in. diameter by 12 in. long to approximately 2,000 F., in preparation for the upsetting of the valve heads. The conveyor speed is keyed to turn out 3,000 pieces per hour, equivalent to heating 870 lb. per hour in a heating cycle of 5 min. The furnace conveyor is equipped with a variable-speed transmission so as to obtain a variation in conveyor speed of from 2 to $\frac{1}{2}$ ft. per minute. The span of the furnace's heating length from the inside of the charge-end wall to the center line of the discharge pulley is 10 ft. with a depth of 12 in. Height in the combustion chamber is 16 in.

A single oil burner placed in the discharge-end wall, with provision for converting to gas burners, heats the furnace. For conversion to gas firing eight burner blocks are placed in the rear wall.

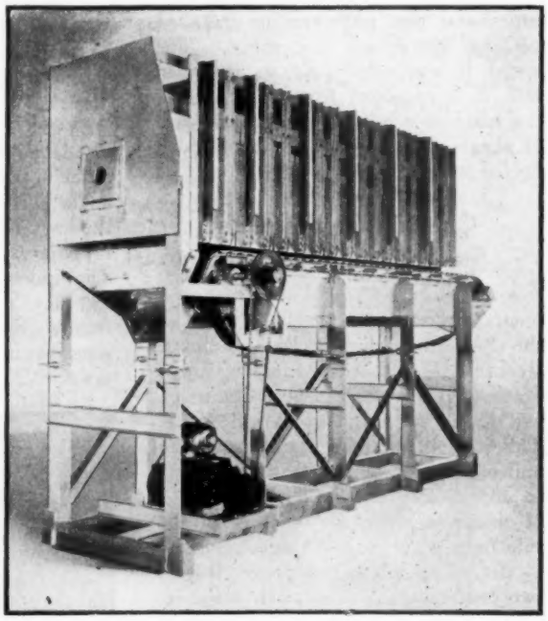
Work is carried from one end of the furnace to the other by a chain conveyor. The valve rods then pass through a sloping discharge into the magazine box of the forging machine.

"Supero Siameez" Welding Hose

Twin hose, simultaneously molded with a connecting web between them, so that a cross-section resembles the figure 8 is now marketed by the Electric Hose & Rubber Co., Wilmington, Del. Known as "Supero Siameez," this hose is made with the individual hoses in different colors, thus red and black or red and green, or both hose lines can be of the same color. A single length of this non-kinking hose is all that is necessary for equipment which heretofore has required two separate lengths. With the $\frac{1}{4}$-in. size the burst strength is 2,000 lb. per sq.in. The Supero construction permits the use of differing pressures in each side without torque or writhing.



Russian truck commission bought Surface Combustion furnace, below



The Round Table

GOING PLACES

"Have you ever been through a big automobile plant, Al?"

"Several of them, Ed. Why?"

"Isn't it slick the way they machine parts, put them on conveyors and feed them into the assembly department? It must take some planning to keep the right parts going into the right place and at the right time."

"Sure it does, Ed. What's on your mind? That look in your eye means something."

"I've been wondering whey we can't make pumps that way, too, instead of fiddling along on a small lot basis."

"I guess we all have dreams of that sort, Ed. But how many kinds of business do you know that are run that way?"

"Lots of them, Al. Typewriters, washing machines, vacuum cleaners, cameras and a lot more."

"Right; but did you ever compare them with pumps—especially our kind of pumps? You mention things that have a wide use. How many people would have any use for our pumps even if we gave them away?"

"But all companies began in a small way, Al. The big ones worked up to their present size by going after business hammer and tongs. We could increase our sales a lot by more aggressive methods."

"You've been doing more than visiting auto plants, Ed. You've been reading some 'pep' stories on 'How I Built Up a Big Business on a Shoestring.'"

"Well, what of it? Others have done it, why can't we? We should advertise more widely, put on some peppy salesmen and go places."

"It sounds fine, Ed. I hate to be a crape hanger on your bright-eyed dreams, but pumps of our kind are not household necessities nor do children cry for them. Every baby born is a potential customer for an automobile, a radio, a camera and a lot of other things, but not for an industrial pump. I wish they were, but figure up the number of pumps in use and see what you get."

"So you're satisfied to play a small town game, Al?"

"I'm sorry to disappoint you, but I

figure businesses like ours about like I do a motor boat. If you're content to jog along at 8 miles per hour an eight-horse motor may do the trick. If you want to double this speed you'll need about a 60-horse motor. We have a fair business without much sales cost because we build a darn good pump. We've doubled that business by sales effort and because we are better known through advertising. But doubling again is going to cost us a lot more to sell the extra quota of pumps. Sometimes, Ed, its smart to stay small. People who try to go places too fast sometimes stub their toes."

Should an industrial product be pushed into the mass production class? Or is Al's conservative attitude more sound?

DISCUSSION

Yes, Yes!

I don't want a yes man, but I want a man who agrees with me, at least in those things where I know that I am right. I want a subordinate who will express his own views freely and honestly, but I want those views consistent with mine. But suppose that he cannot honestly agree. That merely shows his error. He may lack information, in which case he should be glad to get the information from me. He may not understand the principles involved, and in that case he should appreciate my explanation.

Is that not the real situation where we find yes men desired? We do not like yes men. Few executives even respect a yes man as a subordinate. But we all want men who are right, and when we are sure we are right, we want our subordinates to agree, not because of anything that we say, but because of their own thought and understanding.

A. W. FORBES,
Forbes-Myers.

When to Weld

Al's statement that "where you have large enough quantities, castings are probably cheapest," indicates that possibly Al isn't the man-about-town he sounded like in the first part of his dissertation. For arc welding, by its simplicity and other advantages, is particularly economical in quantity production.

In manufacturing by welding, each

step of production can be studied and made more efficient. Starting with simplified designing, a feature of welded construction, the parts for repetitive products can be cut to proper size at high speed by using flame-cutting or machine-cutting equipment. Product assembly can be simplified by making jigs and fixtures to hold the parts in accurately designed positions while welding. The jigs and fixtures permit turning the work and completing all necessary welding as one operation. Machining after welding is unnecessary in many cases.

As the quantity of products that are welded increases, savings increase. Soon the simplified design, elimination of patterns, faster assembly, lower-cost materials (steel) and reduced machining provide large total savings. And with these savings, arc welding provides higher strength, greater rigidity and greater resistance to fatigue and shock.

In our own production, we make thousands of quantity parts of welded steel in place of castings and realize a decided saving in cost. Other manufacturers are doing likewise. Many companies report production savings upwards of 30 per cent.—A. F. Davis,
Vice-President,
Lincoln Electric Company.

Here's the way to
GAGE GAGES!

True gage worth is determined by the amount of work accurately measured per dollar of gage cost.

Economy in gaging is a matter of materials, methods, and accuracy in manufacture. Check Taft-Peirce Gages against any others on the basis of work measured per dollar of cost—and let your business judgment decide. Literature or prices?

THE TAFT-PEIRCE MFG. CO.
WOONSOCKET, RHODE ISLAND
2785

New Tricks

Al is right in objecting to too much instruction by his new foreman, and I speak from 35 years' experience.

In the old days the toolroom foreman would toss a blank on your bench and tell you to make a set of tools for producing the part. The smart toolmaker traveled from shop to shop and accumulated a lot of knowledge either through his own initiative or from watching the fellow working next to him.

The best toolroom foreman I ever knew was not a first-class toolmaker and did not pretend to be, but he was a good organizer and understood his men well enough to let the good ones use their judgment, even if it meant disregarding the tool drawings, and instructed the second-rate toolmakers and the apprentices according to the latest methods.

The wise old guys will adopt the new methods automatically, if they are worth anything. Their feelings will not be hurt by trying to get them to adopt your pet methods.

J. N. Hoffman,
Underwood-Elliott-Fisher Company.

Al is absolutely right in objecting to too much instruction of the men by the foreman. So long as Jim Weston produces good work within a reasonable time, the foreman will do well to steer a middle course. Of course, there will be times when the foreman can suggest better ways of doing a job, but before he speaks he must satisfy himself that his way is the best. As an alternative he can encourage initiative by letting his men solve their own problems.

If the foreman goes up to old Jim Weston and says, "That was a mighty good job you turned out yesterday," Jim will turn to him with a twinkle in his eyes and murmur through tobacco-stained lips, "Thanks boss, I tried to do my best."

Tact, good judgment, praise when praise is due—these are all characteristics that go to make up the successful foreman. After all, the conduct of a shop is a cooperative effort to which each workman and each machine contributes his or its bit.

—Roger C. Dickey,
International Paper Box Machine Company.

Home Talent

I don't think Ed has a case. When Al said "—it pays us and I hope it pays Bill, too," he put the seal on everything, for the profit yardstick is the only sure method to go by.

Ed can't expect all his men to learn heat-treatment; it will have to be in the hands of one or two. They may get the swelled head, they may get sick, they may be on vacation or there may be a rush of work, any of which will slow down production. To get out of it by not using modern steels is to turn one's back on progress. Ed may as well sell his car and buy a four in hand. No, send the heat-treating jobs to the specialist every time. —F. Young,

Wakefield, Yorkshire, England.

Black List

Al's stand is decidedly not best for his company and his men. If you are paying a good man to the limit of your pocket, or if you would like to pay him more than the top rate, but fear an unfavorable reaction from your other employees, let him go with your blessings if he wants more money. I don't think anything satisfactory can ensue if he is tied down to one shop.

We all know that men are tempted to change in times of an abnormal rush of work, and then after it is all over they will apply again to their former employer for work. It does not require a university degree to know that districts where the black list is in operation are shunned by the best workers. This is mainly the reason why skilled men stay in congested industrial areas in preference to smaller and healthier communities.

—R. L. Haselgrove,

Middlesex, England.

If Al waters the dose down well with common sense before he takes it, I don't think it will do him any harm. Taylor proved that the high-priced man is worth his money and no thinking man will dispute it. Al's men will think more of him for his independent spirit and for his stand on their behalf, and he will attract the best men and will probably keep them. At the same time, he will have to be careful or he will have enough internal friction to discount what he will gain from his extra-good men.

Nor do I think he should ride roughshod over the boys in town. When the heads of several plants get together there are usually many bits of valuable information going around. If this is so in Al's case and he falls afoul of the boys he will miss this pooled information, which may again be sufficient to outweigh the gains he will make in men. He should explain to the other plant owners that he alone can fix the price that a man is worth.

U. S. Grant,

Rothwell Haig, Leeds, England.

Praise in Public

Open praise, with private rebuke, is one method of handling men, while outspoken bluntness, either in praise or blame, is another. Either method is legitimate and successful if done spontaneously, but in such matters it is unwise to adopt a rule but rather to obey impulse.

Instead of spurring men on to continued effort, open praise may have the opposite effect on them of developing slackness. It may also engender jealousy.

I appreciate blunt, straightforward men, though occasionally hurtful, rude or bullying. The "John Bull' characteristic is very useful in a workshop, especially when accompanied with a little discretion between callous thick-skinned men and the willing sensitive ones. In conclusion, I would say cultivate the men in a straightforward manner but use impartial discipline.

—William Bryce,

Sheffield, England.

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LIGHT-WAVE EQUIPMENT. Circular M21 describing light-wave equipment for accurate measurement has been prepared by the Van Keuren Co., 12 Copeland St., Watertown, Mass.

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